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ABSTRACT

This conference focused on the many elements of distance education that must be integrated into a smooth-functioning whole that provides a quality learning experience. This proceedings contains 76 papers presented at information sessions, 14 workshop papers, and one addendum. Topics include learning environments; learning strategies; funding; teaching methods; front-end planning; instructional design; learner and teacher support; traversing state boundaries with distance education; distributed project team management; facilitating virtual learning teams; distance education consortia; courseware; virtual tours and videoconferencing; teaching mathematics, science and technology on the Internet; collaborative learning; student orientation; World Wide Web-based conferencing in postsecondary instruction; live, online collaboration; the National Guard Distributed Training Technology Project; legal terminology on the Internet; program and course evaluation; increasing enrollment in adult distance education; community development; computer conferencing and policy; electronic library resources and instruction; quality standards and assessment; distance on-the-job training; curriculum redesign; distance learning as organizational change; interpersonal group dynamics; vicarious learning; consortia; Navy use of distance learning; improving audio quality; institutionalizing distance learning efforts; faculty training; design models; final research results from the University of Wisconsin/Lotus experience; technological integration; asynchronous discussions; interactive television; minority adults' participation; enhancing Web instruction; teaching information literacy skills online; and online testing methods. (DLS)

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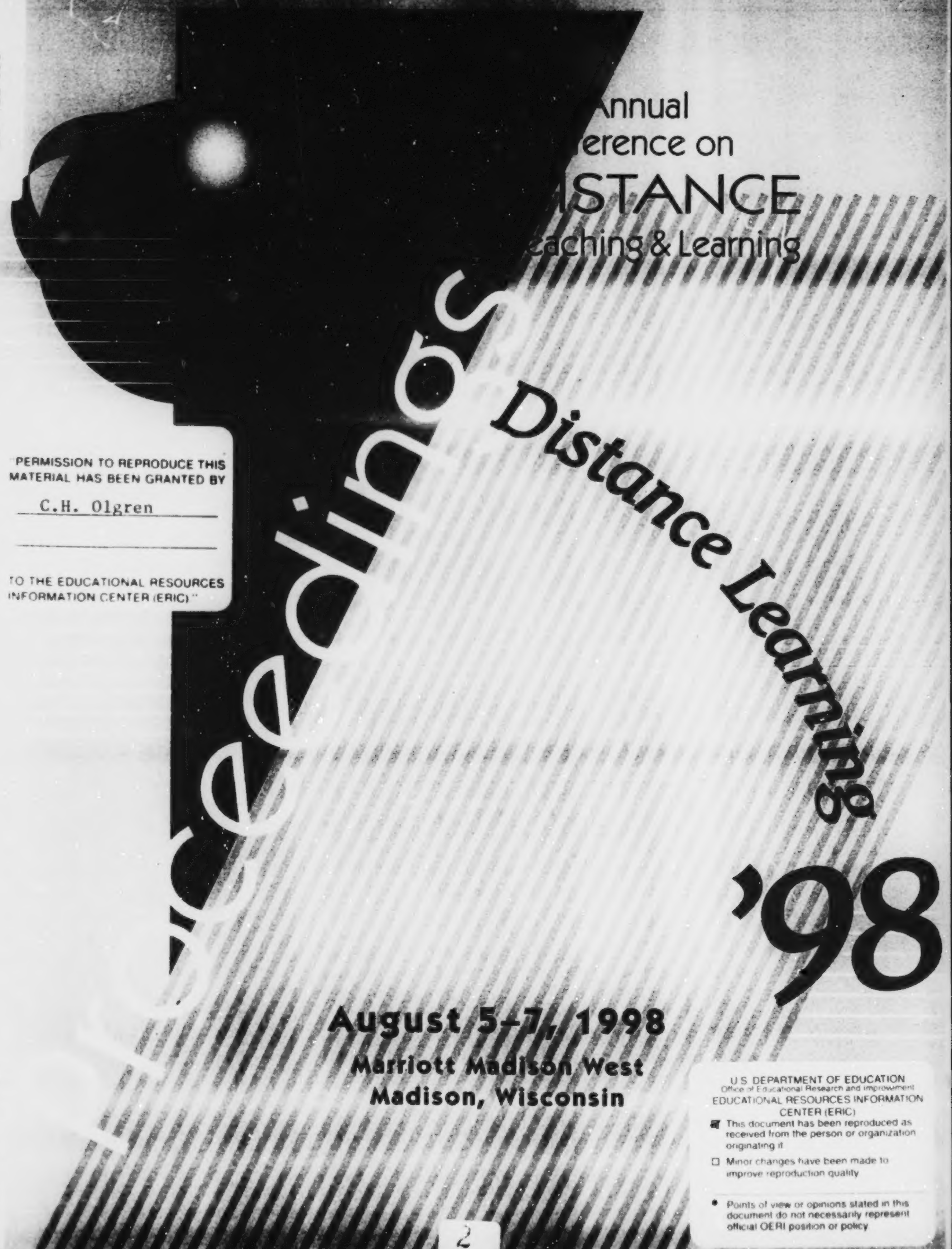

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Proceedings

Distance Learning '98

August 5–7, 1998

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14th Annual Conference on Distance Teaching and Learning

August 5–7, 1998
Madison, Wisconsin

Welcome to those attending Distance Learning '98 and to those reading this proceedings after the conference. The 91 papers in this publication contain a wealth of knowledge and experience shared by the conference presenters. The papers address a variety of topics, but each topic represents a key piece in a total distance education system. From a systems perspective, distance education is made up of many elements. Those elements, which are topics covered in the conference proceedings, include:

- Front-end planning
- Management and policy
- Course design
- Teaching methods
- Faculty development
- Learning strategies
- Learner support services
- Learning environments
- Student assessment
- Program evaluation
- Technology
- Funding
- Research

Also critical to a systems perspective is the need to integrate separate elements into a smooth-functioning whole that provides a quality learning experience. The integration of elements is not easy. It requires knowledge, leadership, and vision along with people's commitment to work together as a team in pursuing common goals.

Because the integration of many elements is vital to distance education, this year's conference is the first time we have not had a specific theme. Rather than focusing on only one element or issue, the 1998 conference charts a new direction. The direction suggests that distance education is moving beyond single issues to broader views that encompass a range of factors essential to effective applications. Adopting a broader view is challenging, but it goes to the heart of best practice in emphasizing the richness of distance education today.

On behalf of the Conference Planning Committee, my thanks to all of the presenters who generously shared their knowledge of distance education and training. And special thanks to Sue Saeger, conference manager, who so capably implemented the many details that go into supporting a conference program of this size.

Christine Olgren
Conference Chair
University of Wisconsin-Madison

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❖ Information Sessions ❖

Supporting Distance Learners and Academic Faculty Teaching at a Distance

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The curriculum in higher education has, with good reason, traditionally emphasized *both* the mastery of concepts and skills through directed learning in controlled environments, and the application of this knowledge through independent study in information-rich contexts beyond the classroom and laboratory. Mastery of discipline-specific knowledge and skills has been fostered through lecture and active learning in the classroom, assigned readings, and carefully constructed exercises. These directed learning experiences ensure that students achieve a desired level of understanding and fluency with basic concepts and skills. The application of this knowledge has been shaped through assignments that challenge students to utilize the rich scholarly resources available to them through the academic library. Here students learn to apply newly acquired knowledge and skills within the interdisciplinary and information-rich environment of scholarly research, to extract relevant information and construct novel solutions to disciplinary problems utilizing the latest research findings. In the distance learning environment, the challenge for educators is to utilize available technologies to engage students in both mastery of course content through directed learning, and the independent application and construction of knowledge required of lifelong learners.

Many distant learning technologies are being effectively utilized in higher education to promote the acquisition of knowledge and skills: Satellite delivery and video streaming allow transmission of classroom lecture; email and chat room technologies support asynchronous and synchronous modes of discussion and group work; CD-ROM and Web-based multimedia delivery platforms permit the development of visually rich tutorials that foster fluency in the understanding of basic concepts and the application of skills through discovery learning in controlled or simulated environments. Digital image and full-text document collections give students access to selected readings and course-related materials selected by the instructor to enrich students' learning. Together, these technologies permit varied and effective approaches to fostering mastery of core concepts, the acquisition of specialized skills, and the application of these in controlled, largely static environments.

But distant students, like resident students, need opportunities to engage in *independent learning* activities utilizing dynamic collections of scholarly resources. It is in this environment that students learn to apply the knowledge and skills acquired through *directed learning* to extract relevant information from a dynamic knowledge base, discover new levels of meaning, and construct novel solutions to disciplinary problems utilizing the latest research findings. In addition, they acquire the skills of information access, retrieval and evaluation necessary to sustain lifelong learning. If distant learners are not afforded the opportunities and challenges of independent learning through access to the collections and services of academic libraries, their educational experiences will be incomplete. There are three challenges academic institutions must address in order to achieve the goal of ensuring that distant students are afforded the opportunities of independent learning all students of higher education deserve:

First, academic libraries must effectively utilize technology to make the rich information resources in their research collections accessible to distant students. Bibliographic and fulltext databases must be available for students to search remotely. These should provide a variety of retrieval methods and browsing capabilities to simulate the experience of actually being in the library: i.e. browsing shelf location or the tables of contents of recently published journals. Provisions must be made to deliver books and other print-based resources to distant students in a timely manner. Copies of journal articles and other documents that do not circulate must be made available as well, either digitally or through document delivery. Archival, microform, or special collections materials, when needed by distant students, may require special handling or alternative access policies.

Second, academic librarians must utilize instructional and communications technologies to extend their services to distant students. Distant students, no less than on-campus users, will require the services of reference librarians for consultation and instruction in selecting appropriate databases and resources, as well as for assistance locating specific information. Additional assistance will be required for these students when no remotely accessible resource is available to meet the student's information needs. Circulation and document delivery services need to be tailored to the needs of distant students, to ensure they have timely access to materials in the collection. The challenge of providing distant services to remote students will require unique attention to ensure that students are acquiring the skills necessary to become independent learners and not simply asking librarians to exercise these skills on their behalf.

Finally, information support staff, faculty development personnel, and librarians must work with teaching faculty to ensure that they understand the limitations of the distance technologies they employ to extend their classrooms. In particular, teaching faculty must understand the importance of complementing their technology-enriched curriculum with assignments that require distant students to exercise independent learning skills in the information-rich environment of the academic library. The numerous technological tools now at the disposal of the distance educator allow faculty to provide students with many effective alternatives for delivering instruction and fostering learning: Readings may be digitized, lectures beamed via satellite or videostreamed across the Internet; synchronous communication via chat rooms and teleconferencing allows for effective group work among students separated by distance, while asynchronous communication fosters more reflective dialogue about issues than traditional classroom discussion typically elicits. The graphically rich environment of the Web generally allows a more holistic approach to learning. Faculty teaching with these technologies may find it easy to overlook the limitations of these tools.

Faculty teaching at a distance must continually be challenged to find ways of ensuring the transfer of knowledge beyond their controlled multimedia learning environments, to the more ambiguous information world in which graduates will be expected to apply what they have learned. In order to continue learning, students need to know how information is organized and accessed beyond the confines of their curriculum. For example, students who only learn to exercise information retrieval skills in the restricted environment of a digitized selection of articles on a CD-ROM, will not be adequately prepared to transfer these skills to the dynamic, open-ended environment of large, disciplinary databases. One of the hallmarks of higher education is that students learn to extend their learning beyond the curriculum to recognize novel applications and discover new relevant knowledge. Information providers believe that "access to adequate library services and resources is essential for the attainment of superior academic skills in post-secondary education, regardless of where students, faculty, and programs are located" (Association of College and Research Libraries, 1998). Discovery learning requires an environment that contains elements of the unknown, and all students, including distant learners, deserve a full level of academic library services as they pursue mastery of course content and practice the skills of independent learning. Information providers, working together with teaching faculty, can find effective ways of achieving these goals.

Meeting the Challenge of Independent Learning

At the University of Nebraska-Lincoln (UNL), we have addressed these challenges by establishing a coordinator position within the libraries to provide oversight for services to distant learners. This coordinator is responsible for communicating both inside the library, with those who provide services and resources to distant learners, and outside the library, with other service units, as well as with faculty who provide instruction using distance technologies. The coordinator monitors all aspects of library service and policies to determine what special provisions are necessary to ensure equality of access by distant learners. She works with the Division of Continuing Studies to identify the needs of distant learners, and strategies for communicating library services to these populations. By representing the needs of distant learners within the libraries, the coordinator ensures that policies and services take into account the special requirements of these students. Prior to the start of each semester, the coordinator contacts faculty slated to offer courses via distance delivery, and educates them regarding the library's support of distant learners. She urges these professors to work with their liaison librarians (whom she also contacts) to identify strategies for incorporating library instruction and research assignments into their curriculum. In these ways, the Coordinator for Distance Education ensures that at UNL, distant learners have access to full library services and resources, so that curricular needs are met, and independent exploration and individual research are supported.

There are three primary aspects of library operations which the coordinator facilitates for distant learners: Access to electronic resources, provision of liaison services, and timely delivery of materials.

Remote access to electronic resources is the cornerstone of library service to distant learners. An Integrated Research Information System (IRIS) provides access to the library's online public access catalog, a full array of scholarly bibliographic databases, a selection of full text databases, reference works, and electronic journals, as well as a classified catalog of Internet resources organized by subject discipline. While each electronic resource features its own user interface, many possess features particularly geared to the needs of the distant learner. For example, the online catalog features a browse function that permits remote students to switch from a subject or known-item search to an examination of adjacent items by shelf location, just as if the students were browsing the stacks. A similar feature of the UnCover journal index allows remote users to examine the tables of contents of recently published journals, in much the same way an onsite user would browse the current periodicals reading room. Another feature of the UnCover database allows students to request notification via email when new items of interest are entered into the database. Fulltext reference works accessible through IRIS include the encyclopedias Britannica and Americana, and the Mental Measurements Yearbook. A growing number of fulltext journals are also available through the Expanded Academic Index, Business & Company Profiles, and JSTOR. Fulltext items may either be viewed on screen or printed/downloaded at the users' site. Although publisher practice varies, the number of electronic journals being made available fulltext continues to increase slowly. Finally, the UNL Libraries' Internet Resources Catalog provides a classified collection of Internet-accessible resources selected for their scholarly content, authority, currency, stability and creativity. The collection includes full descriptive cataloging which may be searched by keyword.

The second major component of library services to distant learners is consultation with appropriate subject liaison librarians. Liaison librarians have subject expertise acquired through graduate degrees and research, and their work combines personal contact with professional expertise. At many academic institutions, as well as at UNL, liaison librarians work closely with academic departments. Distant learners require research assistance from knowledgeable subject liaisons no less than onsite students. Through instruction and one-on-one consultation, these librarians help remote students master many aspects of the research process:

- Developing appropriate search strategies
- Identifying resources for a topic
- Evaluating resources for authority and scholarly value

Liaison librarians provide instructional support for remote students in the use of both electronic and print resources. This instruction may be provided to entire classes using distance delivery techniques, or one-on-one via email, telephone or fax. Small group consultation is also supported. Faculty who teach via satellite regularly invite liaison librarians to present instruction; online search skills for the Internet, library catalog, or subject-specific databases may be covered in these interactive sessions. For classes taught via asynchronous technologies, library instruction is delivered on videotape. Communication between liaison librarians and distant learners may be further facilitated if teaching faculty include the appropriate subject liaison in a class listserv or email distribution list. Specialized reference queries may be sent directly to the subject liaison librarian for in-depth assistance, while less specialized reference questions may be posted to a general electronic reference email account. Reference staff monitor these accounts and provide timely responses. Providing reference assistance at a distance is the newest challenge for academic reference librarians. The goal, as for on-site students, is still to enable distant learners to learn the skills of information retrieval, but teaching these skills at a distance requires new techniques and creativity.

Effective and timely materials delivery is the third key component of library service to distant learners. This is particularly critical for distant students residing in locations where they have no access to a library of research quality. In Nebraska, UNL houses the only comprehensive research library in the state, so we have paid particular attention to our delivery services. Once identified through remote access to the library's databases, materials may be requested electronically by email, web, fax or mail. Requests may be placed for items that are in our collections, or that must be borrowed from other libraries. Books are delivered directly to students' homes by U.S. postal service; students are responsible for return postage. Journal articles are delivered by mail or fax, with charges being absorbed by the library. An electronic reserve service, accessed through the IRIS system, allows students to retrieve materials placed on reserve by faculty.

Distant students receive a variety of handouts before the start of their class, describing these library resources and services. A Webpage has recently been established to provide additional information and assistance to the remote student trying to access library resources and services. This webpage provides links to existing library and university services relevant to distant students. Enhancements to the Website are envisioned that will incorporate more interactivity and multimedia applications.

Future Directions

There are many opportunities for enhancing library services to distant learners in the future. In the area of access, we are still waiting for technology to catch up with our vision. For example, while we currently offer access to a select number of fulltext resources, printing and downloading of this information often proves to be problematic for the remote user. Meanwhile, information providers must continue efforts to work with publishers and professional organizations to resolve issues pertaining to the protection of copyright and intellectual property in the storage, retrieval and dissemination of digital media. Advances in network security are needed to ensure that copyrighted material posted on the Internet can be protected from unauthorized access.

In the area of service, we are striving toward an environment where multimedia instruction will be available to distant learners via the Web. Tutorials providing 24-hour, point-of-need instruction will guide students through the intricacies of conducting independent research, accessing appropriate subject-specific resources, developing search strategies, and evaluating results. These information literacy skills are the foundation of a literate society, and information providers seek innovative ways of effectively transmitting these skills to distant learners. In addition, we must develop creative approaches to liaison service, making use of synchronous as well as asynchronous communication technologies to provide reference and consultation. We will also continue to seek opportunities to collaborate with teaching faculty to design meaningful independent learning assignments that will further students' understanding of course content, while extrapolating it to the information-rich and dynamic environment beyond the classroom.

Delivery of materials will continue to be a challenge in order that knowledge contained in print-based media are available to the next generation of scholars. This may mean digitizing documents on demand for delivery via the Internet or fax. As distance learning technologies advance, novel solutions will be required to ensure equitable service to both distant and on-campus learners. As the community of information providers and distance educators has found, "effective and appropriate services for distance learning communities may differ from, but must be equivalent to, those services offered on a traditional campus" (Association of College and Research Libraries, 1998). And as academic libraries enrich their collections with increasingly diverse electronic resources, consideration will need to be given to how these products will benefit students both at a distance and on campus.

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Traversing State Boundaries With Distance Education: The Tri-State Agricultural Distance Delivery Alliance

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Abstract

The Tri-State Agricultural Distance Delivery Alliance (TADDA) is a new distance education consortium. The three land grant universities in the Pacific Northwest (the University of Idaho, Oregon State University, and Washington State University) developed TADDA in cooperation with Eastern Oregon University and three of the region's community colleges. TADDA was established to develop and deliver a bachelor's degree program in General Agriculture to distant learners located at community colleges and other learning centers in the region.

The presentation describes the TADDA consortium and identifies some of the principal challenges that face the Alliance. The cultural differences among the three land grant institutions, the regional university, and community colleges tend to be the greatest barrier to inter-institutional collaboration.

Background Information

The University of Idaho College of Agriculture established a cooperative Bachelors of Science degree program in General Agriculture with the College of Southern Idaho (CSI) in 1994. CSI is a community college located at Twin Falls and is situated in a major agricultural region in Idaho that is located 430 miles from the University of Idaho's Moscow campus. In this cooperative "2+2: university plus community college" (Witherspoon, 1996, p. 113) program, CSI provides the lower division classes for the bachelor's degree while the University of Idaho provides the upper division courses via distance education.

Other community colleges in the Pacific Northwest region expressed interest in similar cooperative distance degree programs in agriculture. In 1996, leaders from Colleges of Agriculture at the University of Idaho, Oregon State University, and Washington State University met to discuss the potential for the development of a tri-state agricultural degree consortium.

In 1997, the three Colleges of Agriculture and several community colleges in the region formed TADDA. The focus of the Alliance is the development of a multi-state, collaborative, bachelor's degree program in General Agriculture that can be delivered to place-bound learners in the Northwest. To create the bachelor's degree, the community colleges provide the lower division courses while the three land grant institutions develop the upper division courses for delivery to the community college campuses.

Although the courses are developed separately, they are mutually accepted by all three degree-granting institutions. Responsibility for providing the necessary student, faculty, and administrative support is coordinated by the Alliance and shared among the participating institutions. However, actual delivery of the upper division coursework is managed by the originating institutions.

The ultimate goal is to create a seamless Bachelor's of Science degree program that is available to distant learners at various sites in the three-state region. In addition to community college sites, coursework could be delivered at a variety of other community learning centers, including extension offices.

Three grants totaling $730,000 have been awarded to the Alliance to support coursework development and delivery, faculty development, and planning activities. Initial distance education courses were delivered by the Alliance during the fall of 1997. Plans are underway to develop more than 30 new courses for distance delivery during the next two years.

Current Members of the Alliance

Membership in the TADDA consortium consists of the three degree-granting institutions (referred to as the "home" institutions by the Alliance) and the participating community colleges (called the "host" institutions). Members of the Alliance are:

Degree-granting or "home" institutions

- University of Idaho
- Oregon State University (in association with Eastern Oregon University)
- Washington State University

Community college or "host" institutions

- College of Southern Idaho (Idaho)
- Blue Mountain Community College (Oregon)
- Treasure Valley Community College (Oregon)
- Walla Walla Community College (Washington)

Potential additional members include all other community colleges in the tri-state region. The Northwest Tribal College, which has a degree in natural resources, has expressed an interest in participating in the Alliance.

Challenges of Inter-Institutional Collaboration

Numerous issues must be resolved to deliver a cooperative distance education degree program. Among the challenges are: selecting appropriate technical delivery systems; developing coherent institutional policies and administrative procedures; and establishing consensus with regard to the content of courses and the degree curriculum. Additional challenges include engaging departments and individual faculty members to participate in the process, and providing comprehensive student support services at the participating institutions.

While many cooperative distance degree programs have one lead institution, TADDA represents an inter-institutional program with three lead institutions. Achieving consensus among the three land grant universities presents special challenges for the Alliance.

Although technological and pedagogical issues are basic to successful distance education programs, the greatest barriers to inter-institutional collaboration tend to be structural and reflect differing institutional cultures (Driessner, 1998). The diverse cultures of the three land grant universities have affected the Alliance's ability to achieve important consortium goals.

Common Curriculum

One goal of the Alliance is to develop a common general agriculture curriculum among the three degree-granting institutions. Although each institution offers a degree in General Agriculture, the requirements for each degree program vary. The three Colleges of Agriculture are structured differently with regard to the content areas of family and consumer sciences and natural resources. For example, programs in family and consumer sciences are part of the Colleges of Agriculture at the University of Idaho and at Washington State University. At Oregon State University, this program area is housed in a different college. The natural resources disciplines present a similar situation. Oregon State University's College of Agricultural Sciences and Washington State's College of Agriculture and Home Economics include programs in the natural resources such as wildlife, fisheries, and range management. At the University of Idaho, these natural resource programs fall under the College of Forestry, Wildlife, and Range Sciences.

Another goal of the consortium is to provide mutual acceptance of all TADDA courses by the three degree-granting institutions. The current variance in degree requirements, and diversity of programs among institutions makes the goal more difficult to achieve. The challenge remains for the Alliance to develop a common curriculum without confining or inhibiting the autonomy of the three Colleges of Agriculture. Until consensus is reached, the participating institutions have the responsibility to help students examine the options and to make compatible choices.

Seamless Course Development and Delivery

The creation of a seamless mechanism for course development and delivery is another goal of the TADDA consortium. Again, this objective is complicated by the organizational structures of the three land grant institutions. The development and delivery of the TADDA coursework is managed by the originating institutions. Each of the degree-granting institutions uses a different model for course development. For example, Washington State University uses a centralized approach. Their Extended Degree Program office provides all of the necessary support for course development and delivery.

The development and delivery of Oregon State University's coursework are coordinated with Eastern Oregon University, another Oregon institution that has a long history of delivering successful distance education programs. At the University of Idaho, distance education program development and delivery are decentralized and handled directly by the College of Agriculture.

The three models for distance education course development and delivery used by the Alliance members reflect the unique culture of each institution. Each of the approaches has advantages and disadvantages—there is no ideal organizational model. Both central and local support is critical for program success. According to Driessner (1998), the consortium's goals and objectives must be supported at all levels of the institution but must be operationalized "at the level where decisions are being made, services provided, and resources allocated" (p. 2). The challenge of working with different delivery models is to achieve a balance whereby the necessary administrative decisions can be made at the institutional level without exerting undue influence over the mission and values of the consortium.

Conclusion

Distance education provides educational institutions with opportunities to compete or collaborate with other institutions (Moore & Kearsley, 1996). The three TADDA land grant institutions often compete for students in the Pacific Northwest region. The Alliance is an example of institutional collaboration for the purpose of sharing courses and programs as a distance education consortium. Driessner (1998) states that "inter-institutional collaboration is more likely to be successful if it is mission driven and mission consistent" (p. 2). In the TADDA program, the mission is to serve the needs of distant learners by providing a quality, collaborative bachelor's degree program in agriculture. To achieve the consortium's ultimate goals, the TADDA institutions must identify and mitigate their cultural differences.

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Managing a Distributed Project Team

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Background

A hallmark of the 1990's has been the efforts in the workplace to accommodate the "flattening" of organizational structures in business that occurred in the 1980s. Successful managers have been required to accomplish more with significantly less resources. The Instructional Design field is, understandably, not an exception. With the reduction of the numbers of Instructional Designers in most organizations, Project Managers have been turning to outside resources to develop instructional materials. One way to maximize these resources is to apply the same technology which has allowed for delivery of training over long distances. With the advent of fast modems and PCS, Project Managers are able to effectively utilize the wealth of Instructional Design skills which were displaced from the organizational work environment. These resources have become available as independent consultants. Frequently, the best qualified designers are not locally available and must be recruited from widely dispersed, virtual office locations. Through thoughtful application and considerations of using a geographically distributed project team, Project Managers are able to successfully develop learning materials for use in both traditional and distance learning settings.

Will a Distributed Team Work for This Project?

Before selecting a Design Team for the project, the Project Manager must determine if the project must be done locally or if a Distributed Team will be effective. With careful consideration, most projects can lend themselves to being accomplished by a Team with one or more members telecommuting or in virtual offices. This may be uncomfortable for some Managers, depending on their experience, management style, confidence in the individual Team members, and the "maintenance level" of the client.

Types of projects which should not be considered for a Distributed Team are:

- Projects where the client is likely to require frequent visits with the Project Team and will need to see all the Team members to provide guidance.
- Projects with a limited budget for Team members to travel to meetings with the client or for information gathering.
- Projects which are likely to have frequent and significant changes to scope, deliverables, or timeliness because any or all of these are not well defined.
- Projects where the primary source of project information is not readily portable or available from a remote site. An example of this might be a master performer who only is available during specific periods and at a single location.

To a various extent, all of these issues may be overcome. The cost, however, will be increased complexity of the management effort with a resulting increase in project costs and potential for significant project issues.

Projects which are much better suited for using Distributed Project Teams are:

- Those where the client already has confidence in the Team and the Project Manager and does not need to be involved in the daily operations and decisions of the project.

- Projects where the work products and deliverables are well defined and understood by the client and the Team.

- Those where the content and instructional strategies are well defined at the outset and which require few adjustments from the client once development is underway.

- Projects where the timeliness and the budgets support periodic meetings with the whole Team and the client. These should be few but they do need to occur.

Who Should Manage the Project Team?

As a Project Manager just given a requirement to build a workshop or develop a class, one of the first questions that comes to mind is: "What are the required personnel resources to accomplish the work in the time available?" A key resource is the Instructional Design Team. As the head of the Project Team, the Manager is a key player in determining the successful outcome of any project. However, not all Project Managers will be comfortable with a Design Team they cannot see or influence with a walk down the hall to a Designers' office. Some of the considerations for selection of a Manager for a Distributed Project Team are:

- **Experience.** The Manager should be an experienced, successful Project Manager on past projects which have had high levels of uncertainty. They must be able to deal with the idea that important activity, for which they bear ultimate responsibility, is taking place out of their immediate control.

- **Communications skills.** He or she must pcssess highly refined written and spoken communication skills. Often the directions which the Project Manger provides will be in the form of voice messages or e-mail. Reviews and in-progress meetings need to happen early and as often as practical. Information needs to be shared quickly and accurately. Communications with the Team must be understood the first time to avoid potentially costly errors.

- **Flexible.** The Manager must be able to examine new information that becomes available and quickly reach a decision. With the increased coordination time between Team members, delays can be very costly. At the same time, past decisions should be supported wherever possible to avoid disruption of the Team's efforts unnecessarily.

- **Forceful.** Successful Project Managers working with Distributed Project Teams need to be able to clearly set standards for work products and deliverables and willing to hold the Team to those standards. This does not mean that the Manager needs to be draconian by nature. However, written guidelines and tight controls on work products, backed by frequent reviews of the work in progress, greatly reduce the amount of drift and the resulting re-work of materials.

In short, the Project Manager should be able to take project management skills to the commandment level.

Who Should Be on the Project Team?

Another key consideration in the success of an effective Distributed Project Team is the selection of the Instructional Designers on the Team, their abilities and capabilities. If we accept that their basic design skills of each Designer are adequate, which they must be, then what are the specific considerations that are key in selecting Designers to work on a Distributed Team?

Members of the Design Team should be:

- **Experienced.** Just as with the Project Manager, Designers should have a broad range of experience working on a number of projects with high levels of uncertainty. Designers should also have broad exposure to many different types of delivery means and interventions. Designers on a Distributed Team will often be responsible for generating their own ideas for how an objective is presented and evaluated. Those with a greater breath of experience will produce more interesting and effective materials.

- **Self-motivated.** Designers will take guidance from the Manager, the client, and each other at various points in the project. However, for Designers working in virtual offices, most of their work will be done on their own in their virtual office locations. Designers must be able to set their own work times and deadlines for delivering materials. By the time the Manager is aware that a Designer is in trouble with meeting a milestone, frequently the options for back-up are severely limited.

- **Independent.** Team members must be able to generate ideas and think through issues without a great degree of social interaction. Often, due to varying work schedules, other members of the Team may not be immediately available to act as sounding boards for examining issues or discussing problems on the project. In these cases, the Designer must be able to step back and examine the problem and come to a solution that fits within the project parameters.

- **Comfortable with technology.** It is the advent of technology such as fast modems and PCS that make the Distributed Teams workable. Each member of the Team must be able to efficiently use the tools available to communicate with the other members. Each member should be able to effectively use e-mail and electronic file transfer protocols to send and receive messages and work in progress for reviews. They should understand how to effectively utilize file compression protocols such as Winzip files. Designers should have the capability to check both incoming and outgoing files for viruses. Every Designer must have the same version of development software and should be utilizing standard templates or style guides for all the products being delivered.

- **Dependable.** Not the least of considerations for a Designer is his/her dependability. The Designer should establish firm work hours and make sure other members of the Team are informed of those hours. Then the Designer must *keep* those hours. Voice message capability and e-mail are critical forms of communication and must be answered in a timely and consistent fashion. Typically, responding to voice messages should happen within 24-hours and to e-mail within 2–3 hours.

Conclusion

Distributed Teams have been used very effectively on a variety of projects. The success of the Distributed Team is dependant on good project management as well as many factors, just as with other project teams. Perhaps more so, the ability of virtual office Designers to maintain high quality work, good communications, short turnaround times and dedicated efforts without getting sidetracked by their surrounding environment.

Using a Distributed Team can allow the organization a degree of flexibility and cost efficiency not otherwise available. However, a Distributed Team is a very flexible organization which must contain dedicated team members, be carefully planned, monitored and well managed to be successful.

Autobiographical Sketch

Scott Anderson is a Manager in IDG's Development Practice and has over 12 years of experience in performance improvement and education. He brings to the presentation extensive experience in designing performance improvement solutions for clients in industries such as financial services, telecommunications, and local, state and federal government agencies.

He has designed and implemented quality enhancement programs using distance learning technology to deliver the training. He has also designed basic skills education which was delivered to over 1500 students using distance learning. Scott has designed and presented numerous train-the-trainer programs which have been presented in a classroom environment as well as using distance learning technology.

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Ten Great Tips for Facilitating Virtual Learning Teams

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The Challenge of Virtual Learning Teams

Exceedingly, today's educators are expected to adapt teaching and facilitation techniques to new and emerging delivery systems. The number of educational courses and training programs migrating to the World-Wide-Web, the Internet, and corporate intranets is astounding (see for example Bassi, Benson, and Cheney, 1996). For most educators, the migration to computer-mediated distance education does not come easily. Although at first glance, it seems that traditional teaching methods such as presentation, discussion, and team-based learning can be easily adapted to on-line delivery systems, in reality research is showing that teaching and learning in on-line environments is very different from face-to-face instruction (Luetkehans, 1998; Sherry, 1996). Of particular interest to educators is the effective facilitation of collaborative team learning in on-line environments.

From a student perspective, participating in a virtual learning team (VLT) is a new, and perhaps frightening, experience. Mary Lou Crouch and Virginia Montecino (1997) note a phenomenon experienced by on-line learners called "cyberstress." The asynchronous nature of many on-line courses and communication tools, and the perceived distance between learners and other team members contributes to fears of contributions and assignments left unnoticed and "lost in cyberspace." Students have not developed sufficient experiences for dealing with delayed communications, the generative nature of on-line learning, nor the ability to express themselves effectively to team members through written communication.

The purpose of this paper is to present tips for educators who would like to successfully integrate and facilitate virtual learning teams within their on-line courses. The techniques are grounded in current research and the theoretical foundations of systems theory and group dynamics. Tips emphasize facilitation of virtual learning teams assembled for the purpose of formal education who are supported by computer-mediated communication tools.

Critical Elements of Virtual Team Learning

Task or Problem

A team is defined as "a number of persons associated in some joint action" (Webster's Unabridged Dictionary, 1992). However, all virtual teams are not created equal. The VLT process is affected by the type of task or problem it is given (Straus and McGrath, 1994). As with other instructional strategies, virtual learning team activities can be classified by learning domain (Bannan and Milheim, 1997). Specifically, team activities can be classified as those designed for a.) motivation or attitude development, b.) problem-solving, c.) skill building, and d.) knowledge construction. The instructional goal and the type of team activity has a direct impact on how the team members explore and define team objectives, plan a course of action, and their perceptions of success. A clearly communicated instructional goal and desired performance outcomes of the team are essential no matter the delivery system.

Team Dynamics and Interaction

As with face-to-face teams, VLTs are governed, in part, by the dynamics of group communication. Group dynamics is concerned with both the productive (task) communication of members as well as the development of roles and relationships among team members (maintenance). All teams, whether on-line or face-to-face, will develop and enforce group norms (e.g., acceptable and unacceptable communicative behaviors) and methods for leading, stimulating, rewarding and punishing team member contributions. Often, on-line educators overlook these elements of VLT interaction because they are focused solely on content (task) learning and interaction. Taking a more systems view of team interactions may help avoid so-called "internet pitfalls" (Boettcher, 1997) of on-line communication.

Team Member Roles

The greatest value of team learning may also be its greatest challenge. That is, a group is made up people with a diversity of talents, strengths and experiences. This brings with it the foundation for stimulating discussion, creativity, and effective problem solving. However, it also means that each member of the team comes into it with established habits, learning styles, and preferred team roles. Most of the current literature agrees that effective teams are able to represent a balance between task roles (goal accomplishment) and maintenance roles (process satisfaction and efficiency). Task roles and maintenance roles take on new character in on-line environments. Task roles dominate and are performed both on-line and off-line. Maintenance roles, although critical to team connectivity, may not be performed until conflict arises or inefficiency is felt. The maintenance role of leading consensus is more difficult to achieve on-line (Harasim, 1993).

Mediated Communication

Two factors differentiate a VLT from a face-to-face team: 1.) team members who are "out of sight" and unless a face-to-face introduction has occurred, who are based on an impression established by text and description, and 2.) a reliance on connections between team members made through electronic or computer-mediated technology. Both facilitators and team members must rely on virtual (as opposed to tangible, touchable) connections in order to achieve goals. The result may be a perceived loss of control and security for both the facilitator and the team member. Members fear a loss of productivity if that connection is not reliable or effective.

Facilitation

To facilitate is "to free from difficulties or obstacles; to make easier; to aid; to assist" (Bailey, 1996). VLTs are generally facilitated both from the outside (by the educator) and within (by team members). The role of the outside facilitator (the educator) in on-line environments is changed from that of face-to-face instruction. The role of the outside facilitator, because of the nature of VLTs, entails 1.) ensuring that no barriers (technical, informational or motivational) exist to team learning, 2.) ensuring essential elements for learning are accessible (such as interaction, task information, and feedback), and 3.) aiding team members in times of conflict or confusion.

Ten Proven Techniques for Virtual Learning Team Facilitators

Tips for Facilitating Motivation and Efficacy

Tip #1—Help team members manage "cyberstress" by helping them feel connected to the facilitator and other team members. Help learners overcome initial stress by sending a detailed advance e-mail at the onset of the team activity. Include a welcome, a description of the team goals and desired outcomes, and tips on being a successful team member in an on-line course. Ask members to contribute personal information about themselves as a first communication to the VLT. Ask them to include their background, familiarity with the task/problem, and talents/contributions they will be bringing to the team. As the course continues, manage the stress resulting from delayed communications by sending "receipt" messages. A receipt message is a short feedback message indicating that, although you cannot immediately respond to the learner's message or review the assignment, you received it. Encourage team members to do the same. Help teams establish ground rules for frequency of checking computer-mediated communications.

Tip #2—Plan frequent e-mail prompts to help team members overcome procrastination. It is important to help team members sustain participation. "The major reason for disappearance has to do with a student's feelings of not being connected" (Crouch and Montecino, 1997). E-mail reminders are useful in helping to keep the team activity in the forefront of learner's thoughts. E-mails should not be nagging, but serve as friendly reminders to log-on to the site, ask if assistance is required or for reports on team progress.

Tips for Facilitating Problem-Solving

VLT activities for problem solving typically require methods that encourage both creativity and decision making. Activities which integrate knowledge and skill sets with real problems and contexts may include case scenarios, simulations, team research and reporting, negotiation, and decision making. The facilitator of problem solving must be skilled at supporting the phases of problem solving and in helping teams achieve consensus.

Tip #3—Provide a variety of tools to support the different phases of problem solving. Provide each team an exclusive area on the course website for posting team resources and strawman solutions. Because problem solving requires both exploration and consensus, VLTs should have the ability to access and post hypertext resources for information searching and sharing, as well as tools to develop and debate solutions. Provide a combination of tools for different stages of problem solving. If the problem or case study will take several sessions to solve, teams will benefit from access to an asynchronous tool that can be used to keep the history of the team's discussions and negotiations. If the problem can be resolved in a single sitting, a synchronous tool for discussing and defending individual perspectives or even voting can be useful. Asynchronous problem solving is best supplemented with a synchronous tool during stages of negotiation and decision making.

Tip #4—Assist team members when they struggle with achieving consensus. Teams often appreciate the intervention of a neutral facilitator when it comes time to make critical decisions or select among alternatives. Explore methods for polling team members, and for conducting on-line voting. The summary is an effective tool for leading to consensus. Often team members are too busy looking forward to see where they have been. Review team progress, and summarize it as you see it. For example, "I see you are developing two pretty distinct alternatives. The first appears to focus on the navigation needs of the learner. The second focuses on the simplicity of design. Which do you feel are priority given the goal of immediate access?"

Tips for Facilitating Skill Building

Activities that allow for the development of skills may include small group projects and expert modeling. The facilitator of skill development must be expert at designing authentic projects, offering timely and meaningful feedback, modeling, and leading effective reflection and debriefs of skill activities.

Tip #5—Assemble teams strategically based on task and talent. In online environments, larger groups are less productive and have more difficulty arriving at consensus, so consider 3–4 members per team as a target (Dennis & Gallupe, 1993). If possible, teams can be balanced on talent and experience (e.g., with HTML) so that an "expert" in the team is able to provide modeling of the skills and scaffolding for other team members. Assess the skills targeted for development. Design tasks around the targeted skills, and communicate them through clearly stated objectives. Focus tasks on the development of a single competency area, or a small number of skills.

Tip #6—Provide timely and meaningful feedback. Skill building depends on frequent practice and feedback. The facilitator can use semi-private and private communications for feedback. Semi-private communications can be established by providing "exclusive" threaded discussions, chat rooms or Listservs accessible only by team members. Individual feedback should be conducted via e-mail. The facilitator should plan and use process checks as part of project activities. A process check is a planned "check point" for communication, reporting, and questioning on a project's progress. Synchronous tools are effective for conducting process checks. When the activity is complete, conduct an asynchronous debrief discussion. The facilitator should use questioning techniques that stimulate reflection and processing. Modeling difficult tasks and behaviors is another form of feedback, allowing students to compare their outcomes to a benchmark or standard. Use hyperlinks to show learners examples of completed projects, forms, or reports on the course website or in threaded discussion.

Tips for Facilitating Knowledge Construction

Activities that develop new concepts, contexts, and meaning may include reading, information searching and sharing, discussion, inquiry, and reflection. The facilitator of knowledge construction must be skilled at scaffolding discussion, and encouraging exploration and elaboration.

Tip # 7—Scaffold topical discussions using a threaded discussion (asynchronous) tool. An effective scaffolded discussion involves a.) providing an initial structure and b.) facilitating concept construction through questioning. The structure can be minimal. If the discussion topic is new to learners, post a topic name along with 1–2 open-ended questions to initiate thinking. This allows students to construct the concepts and detail. Facilitators should avoid dominating discussions by using relay questioning techniques and only participating when necessary. To encourage continued contributions, reward participants' thoughtful responses with short affirmations. Finally, when discussion objectives have been met, the facilitator can quickly "point to" the learning with a brief summary. Summaries provide both rewards and reinforcement.

Tip #8—Encourage elaboration through questioning and hypertext linking. As in face-to-face facilitation, effective questioning techniques are useful to encourage elaboration. Use open-ended questions to stimulate a response that builds on prior concepts. For example, "Jack, you indicated 'a survey as one ways to gather information for a needs assessment.' What other techniques could you employ?" Hyperlinks to additional information or expertise can also be used for stimulating elaboration. Many Internet communication tools accept HTML links within the message body. The facilitator should model the use of hypertext in her responses. In addition, e-mail links can be included as a way to access outside experts willing to participate in discussions or private e-mail exchanges.

Tips for Resolving Conflict

Teams will rely on the facilitator to intervene in times of dysfunction. It is the facilitator's primary function to remove these obstacles to learning.

Tip #9—Discourage judgment, criticism and personal attacks. Carefully phrase retributions to comments that are clearly not constructive. For example, "While I realize that we will not always agree with all point of view expressed on this forum, this is a reminder to reflect and build on *ideas,* not judge the *person."* This type of conflict can be avoided if teams adopt ground rules that encourage members to suspend judgment and accept diverse views. Post the rules at the beginning of a team activity or on the course website. Monitor the interaction and remind members when a contribution is outside of the accepted rules.

Tip #10—Intervene to highlight areas of common ground among conflicting team members. Team members will expect the facilitator to intervene when conflicts get personal or unproductive. Start by helping team members see areas within their conflict that they agree upon. For example, "Sara and Tom, you seem to be at a stand still. In reviewing your discussion, it appears that you are both concerned that the end product be visually appealing. Is that correct?" Encourage the use of synchronous tools to resolve heated conflict in a timely fashion. Phone conferences may be more effective than computer-mediated communication to resolve personal conflict.

Drawing on a theoretical framework emergent from constructivism, systems theory and group dynamics, this paper presented ten proven tips for facilitators of virtual learning teams (VLTs). An on-line facilitator's required skills range from selecting and designing appropriate on-line tasks to assembling teams and removing obstacles to team task and maintenance roles. Of greatest importance is to intervene on any matter that deters a team's technical, informational, or motivational needs. As more courses migrate to computer-mediated environments, on-line facilitation skills will become increasingly critical to educators.

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Autobiographical Sketches

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Distance Education Consortia:
The Northwest Experience

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Introduction

Fulfilling community and technical college missions in light of increasing economic, political, and social pressures is a challenge confronting Washington and Oregon community and technical colleges as they transition into the next century. It empowers students by permitting greater access to information, by increasing the variety of learning options, and by granting students greater control over the pace and manner of learning. Distance education is one important way for the Washington and Oregon community and technical colleges to keep the "open door" open and remain relevant, responsive, accessible, and affordable.

While most community and technical colleges individually offer courses by distance education, they are increasingly challenged to provide the full range of instructional and student support services needed for expanding distance education programs. To address that issue, Washington and Oregon community and technical colleges formed distance education consortia to leverage individual college investments and faculty expertise to provide unserved and underserved students with low-cost, quality educational opportunities that surmount time and place barriers. Additionally, these partnerships distribute costs over a broader base to achieve economies of scale to develop distance education policies, implement cooperative distance learning procedures, and deliver community college instructional programs and services that combine the best technology practices with the best teaching and learning practices.

Background

Oregon

Beginning with the formation of the Oregon Community College Telecommunications Consortium (OCCTC) in 1981, the Oregon community colleges recognized the benefits of working together to deliver instruction to time-bound and place-bound students throughout the state (Baker, 1997b). OCCTC's guiding principle was the vision that the consortium would investigate and implement other telecommunications modes for use by persons, organizations, businesses, and agencies in the college districts. OCCTC formed working relationships with Oregon Public Broadcasting (OPB) and other public television stations in the state. In 1986 the community college presidents placed telecommunications as a priority in their long-range planning and colleges began purchasing satellite dishes. The consortium changed its name in 1995 to the Oregon Community College Distance Education Consortium (OCCDEC) to better align with the broadening scope of the consortium's activities.

Oregon's community colleges currently provide distance education in a variety of forms that include telecourses, online courses, ED-NET (satellite delivered) courses, correspondence courses, videotaped courses, and two-way interactive video courses. As noted in Table 1, the 17 Oregon community colleges collectively serve thousands of students by distance education.

Table 1. 1997–1998 Oregon Community Colleges Distance Learning Enrollment Data

Distance Learning Mode	Class Sections	Enrollment	FTE
Telecourses	403	12,130	909.4
Online Courses	506	8,097	563.9
Correspondence Courses	16	272	17.4
Videotaped Courses	157	1,034	76.0
Interactive Video Courses	85	1,406	105.3
Ed-Net Courses	2	14	0.9
TOTAL	1,169	22,953	1,672.9

Washington

Distance education consortial efforts in Washington's community and technical colleges parallel those in Oregon. Prior to 1977, college telecourse coordinators met informally to address telecourse distance education issues (Washington State Board for Community College Education, 1990). With the formation of the Telecommunication Center for the Washington Community Colleges, the Video Telecommunications User Group (VTUG) was formed to support the use of telecourses. The VTUG mission quickly expanded to include other forms of distance education and the organization changed its name to the Coordinators of Distance Education (CODE) in 1995 to better reflect its expanded roles and responsibilities. That role was further expanded in 1998 when CODE became the Distance Learning Council of the Instruction Commission.

A regional approach for the delivery of video-based courses was achieved in 1995 with the formation of the Northwest Telecommunications Network (NWTN)—a consortium of 16 community and technology colleges in the Puget Sound corridor (Baker, 1998). NWTN's goal was to work with local governments and commercial cable television systems to create a coordinated, seamless telecourse delivery system across political and institutional boundaries.

Consortial efforts were advanced in 1995 when the Washington State Legislature allocated funding for a statewide Educational Technology Initiative (ETI) to support the use of technology in instruction (Washington State Board for Community and Technical Colleges, 1996). This initiative was followed with a legislative appropriation for the K–20 Educational Telecommunications Network (K–20) to create a comprehensive statewide technology infrastructure to delivery of distance education to K–12 sites, community and technical colleges, and universities (Washington State Department of Information Services, 1996). As with the ETI initiative, K-20 funds are limited to technological infrastructure and equipment purchases only. Implementation of the K-20 network enables colleges to use interactive video as a means to collectively offer courses that historically experienced cancellations or low enrollments at individual colleges.

Like the Oregon community colleges, the Washington community and technical colleges provide distance education to thousands of students in an expanding variety of forms (see Table 2). Reflecting the demand for distance education courses, the community and technical colleges conducted an Educational Technology Strategic Planning Process (ETSPP) that recommended the formation of the Internet/Distance Education Consortium of Washington to collectively meet the expanding demand for online classes (Washington State Board for Community and Technical Colleges, 1996).

Table 2. 1996–1997 Washington Community and Technical Colleges' Distance Learning Enrollment Data (Baker, 1997a)

Distance Education Activity	Class Sections	Enrollment	FTE
Correspondence Courses	1,086	5,311	547
Telecourses	906	18,288	1,943
Audio Teleclasses	41	274	27
Interactive Video Teleclasses	134	881	92
Online Classes	111	1,142	93
Multimedia Conferencing	8	30	3
TOTAL	2,286	25,926	2,705

Current Initiatives

Oregon

In June of 1997 the Oregon community college presidents and the Commissioner of the Office of Community College Services unanimously adopted the Strategic Plan of the Oregon Community Colleges for Distance Learning (Baker, 1997b). This landmark agreement extended the OCCDEC consortium to form a comprehensive framework for statewide cooperation in distance delivery of instructional programs and support services.

The community college distance learning strategic plan, with its unique statewide inter-institutional *Host/Provider* partnership agreement, incorporates and complements the academic and technological investments made by partner colleges. In the *Host/Provider* model, a host college is a college that incorporates a provider-developed courseware as part of, or in support of, the host college's curriculum. Host colleges are responsible for the student services components of a student's learning experience. A provider college is a college that supplies the instructional component of the course. Host colleges and provider colleges have identifiable roles and responsibilities that are outlined in the distance learning strategic plan. The consortium, too, has a defined role. The consortium is responsible for those elements necessary to support inter-college distance learning activities for all community colleges, both hosts and providers.

Washington

The presidents of Washington's community and technical colleges authorized the formation of the Washington Online Consortium (WAOL) in 1997 (Baker, 1998). This statewide consortium was developed as a mechanism to offer an Associate of Arts (AA) degree entirely online. The presidents committed startup funding for the consortium to develop online student services and to develop 20 online courses. The Student Services Commission and Instruction Commission are each developing policies and procedures to support this effort.

Related Consortia

Consortia are emerging as one of the most powerful ways in which libraries can support distance education. They help individual libraries leverage limited resources to address rapidly changing technologies, changes in the scholarly publishing industry, and increasingly diverse and dispersed student populations. Collectively, library consortia provide services and opportunities for students that go beyond the capacity of individual libraries.

Community and technical colleges in both Washington and Oregon have a history of regional collaboration with public libraries and four-year college/university libraries. In recent years, those efforts have been escalated to building statewide consortia. In some cases, those consortia have crossed state boundaries. Proposed 1999 legislative budget requests have been developed in both states to support these efforts.

Sustainability

Washington and Oregon community and technical college distance education consortia have evolved from grass roots cooperative efforts to more formally structured integrated elements of broader statewide educational strategies. While differences in organization, funding, and governance exist between states, the sustainability of distance education consortia in both states depends upon three primary factors: a) clear and consistent visions for collaboration among institutions, b) institutional and statewide policies and practices that support the implementation of that vision, and c) consistent and assured funding commitments for distance education consortial operations.

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Autobiographical Sketches

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Developing Courseware for Distance Learning— Any Place, Any Time

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Abstract

There is a wide array of approaches that can and do produce materials (courseware) for the delivery of university level courses via the method now commonly known as "Distance Learning" (DL). DL has increasingly become a part of university systems across the United States and is expected to grow to 10% of enrollment at Rochester Institute of Technology (RIT) by the start of the next millennium. RIT has been a pioneer in the DL format with over 148 courses offered each year. With this expected growth of course offerings, a considerable amount of strain has begun to and will continue to take place on production support personnel and production facilities at RIT and elsewhere. This study supported by a "Provost Productivity Improvement" grant from RIT set out to produce courseware in an unconventional manner that would point the way to an approach that can be accomplished by faculty much in the same manner they produce course materials for conventional "live" classroom delivery. This paper will detail the effort that went into the planning, execution, and delivery of two courses in the graduate level MS/Certificate program in Applied Statistics in the College of Engineering at RIT. In addition, the educational effectiveness of these courses will be reported on by making statistical comparisons with parallel courses taught in the conventional live classroom by the same instructor. Student comments on the courses will also be included as part of the report.

Background

The Televised Classroom

Modern communication technology has negated the need for physical travel to accomplish distance learning objectives. RIT has in its DL offerings utilized VHS video tape to deliver lectures to the students. Video tape is inexpensive, easy to mail to students, and VCR's are in most homes making this delivery media nearly universal. Video tapes are produced in either of two modes. The presenter is simply recorded as he or she conducts an ordinary "live" class. This approach which is called "televised classroom" is usually done in a specially equipped "studio" type classroom on campus. Students are in the audience and some interaction is possible, although there is a bit of reluctance on the part of the students to participate because of the intimidating nature of the TV cameras. Therefore the lecture is a monologue for the most part, although with more planning and direction, this could be a lively approach to re-creating classroom dynamics that are not available to the DL student viewing a tape.

Classroom Television

The second approach to the video recording of the lecture is to place the instructor in a television studio. Visuals used in the class are prepared using any of the many presentation software packages such as Powerpoint®, Persuasion®, or Astound®. The visuals can be prepared by the instructor, or this service is offered by E.T.C. (RIT's Educational Technology Center). The visuals can be cut into the lecture either as the program is unfolding, or edited in later. Visuals that "unfold" are captured with a visualizer that is on the desk with the instructor. These may be cut in at the time of creation, or edited in later as with the computer generated visuals. This formal, studio production (sometimes called classroom television) has the advantage over the televised classroom in-as-much-as the instructor can call "cut" and re-do a sequence if a modification needs to be made. The E.T.C. television facility is the source of all video production for DL courses on the RIT campus. An example of a "big budget" classroom television production is the series Against All Odds produced through the American Statistical Association and funded by the Annenberg Foundation. Against All Odds is an overview series on the fundamentals of statistics and makes extensive use of interviews, on-location situations, and animated visuals all focused on effective communication and instruction.

Satellites: A Costly Delivery System

In the early days of DL, some televised classrooms were broadcast via satellite to the remote sites where a gathering of students watched synchronously with the live lecture on campus. However, the cost of the uplink and downlink is considerable and it is sometimes difficult to get all of the remote students to assemble at the same time. Therefore, the program was often recorded for viewing by those students who were unable to watch it synchronously. Rochester Institute of Technology did not choose to follow this method which is now recognized as a very expensive way of delivering the DL tapes and has all but been abandoned as the prime delivery approach by other institutions. Students also complained that the concept of "any time, any place" was violated by the satellite delivery method. Viewing the tape at the student's own pace and at the student's time of choice has evolved as the most common vehicle of lecture delivery.

The Web as a Communication Tool

During the 1997–98 academic year, RIT decided to put a strong emphasis on internet-based computer communication. FirstClass®, a conference software package was piloted in the summer quarter of 1996 with 3 courses and adopted university-wide in the summer quarter of 1997. First Class has a modern user interface with drop-down menus that have become familiar to most users of Windows 95 or the intuitive Macintosh systems. One feature of First Class is the "Chat Session" that allows the entire class to assemble much like a telephone conference call without the special equipment required for the phone system. It is a text based system only, and does lack graphical (drawing) capabilities. Attached files to First Class messages may be downloaded to be read in application programs as a workaround to the absence of graphics in this text-based communication package. For on-line, live chatting the use of attached files is not as convenient as having drawing capabilities in the chat session itself. This is especially true for technical subjects that rely on graphics to deliver an idea. Since RIT is a technical institution, this deficiency is being addressed to make First Class a more viable tool.

Developing Courseware—Any Place, Any Time

In keeping with the slogan of Distance Learning (any place, any time) and concerned that the E.T.C. video production facilities would become saturated with the planned increase in course offerings, this author decided to approach the production of the video tape lectures in a different manner than was customary at RIT. Another reason stems from the competition in DL that is building from other universities across the country. RIT is not alone in recognizing that to maintain enrollment in an era of a declining student population, DL can make up for the drop in the on-campus student body. In such a competitive market, a superior product can attract more students.

Annenberg Approach as a Model

Using the Annenberg production of Against all Odds as a role model, a proposal for a Provost Productivity Grant was made to produce two one-quarter courses in the MS/Certificate program in Applied Statistics offered by the John D. Hromi Center for Quality and Applied Statistics which is a part of the College of Engineering at RIT. These courses, Design of Experiments I and Design of Experiments II are core courses in the MS program and required courses in the Certificate in Quality program. They are also attended by engineering and science students from other colleges at RIT. This author had taught these courses for over 25 years and is also the author of one of the text books for them. The author is also an active film/video maker with national awards for his film work. With this combination of experience, it was a natural fit to embark on the "do it yourself" approach to the video lecture production of the Design I & II courses. Work had already begun before the grant was approved since the time to produce a DL lecture series on tape could consume from 12 to 18 months as a full-time activity (1). The author was relieved from teaching one "live" course each quarter during the planning and production phases of this project.

The Scripting Process

Script approval. Another part of the non-traditional approach to the DL video production was the script approval process developed by the author. This is a three-stage approval process with the curriculum coordination committee acting as the reviewing body. The Design of Experiments Curriculum Committee acted as the reviewing group for the courses described in this paper.

Discovering efficient scripting. A story board format was adopted for the script writing phase of the DL video lecture project. A number of approaches to writing the script (the most lengthy part of the process) were tried. All of these approaches were centered on discovering the sequence of events in the preparation of materials for the video lecture that would be the most efficient. The least efficient way of writing the script was to do the actual writing first and then creating the visuals to match the script, followed by the student notes. This approach was tried for the first few lectures of the 801 (Design I) course. A typical segment required 37 hours to write the script, develop the visuals, and then assemble the student notes. A comparable segment that started with the student notes, followed with the joint script/visual development process took 23 hours. This is nearly a 40% improvement in efficiency. Also, since the script was developed along with the visuals, the timing of the visuals was more accurate thus speeding the editing process when the "talking head" lecturer is joined with the illustrative visuals to make the final tape. A video instruction tape has been made to illustrate the script writing process.

Developing the Visuals

Since the goal of this DL project was to produce "Annenberg Style" video on a shoestring budget, it was important to have visual illustrations that incorporated the meaning of the subject and at the same time bring it to life. Statistics is usually considered dull. Overcoming this conventional wisdom was the real challenge. One of the nitty-gritty aspects of the visuals involved the application software package used to generate them. While the most powerful way to produce animated visuals is from Macromedia Director® this package is very costly and takes a considerable amount of time and effort to master. Simpler graphic presentation software was preferred in this case. There were two popular presentation software packages available at the time this project was undertaken. PowerPoint® is the most common of these and Persuasion® is the other. Neither of these popular packages were used in favor of a package with exceptional animation capabilities and a time-line control that neither of the aforementioned programs possess. The program used to create the visuals is Astound®. Astound is also capable of exporting a single "slide" or the entire presentation as a QuickTime® movie. In the case of nonlinear video editing, this is a valuable time/quality saver since the visual does not need to be converted to an NTSC video signal from its digital state and then back to an analog output. It can be simply cut into the video during editing of the final video tape presentation.

Production Begins

In keeping with the slogan of Distance Learning (any place, any time) and concerned that the E.T.C. video production facilities would become saturated with the planned increase in course offerings, this author decided to approach the production of the video tape lectures in a different manner than was customary at RIT. With the scripts in hand and an array of audio and video equipment from the author's own inventory, production began. The first "shoots" were done in early September of 1996 since the location involved a farmer's field and a Maple tree fully-laden with seeds. Location shots were considered essential to break up the monotony of the usual "talking head" at a desk approach used by most lecturers who utilize the televised classroom. The locations also give the student a sense that the subject is not just an academic activity, but has real application and the person delivering the lecture has "been there" and can take the student there. This element of the location shots then adds to the competitiveness of the RIT DL product.

Shooting on Location

Shooting on location is probably no more complicated than shooting in the studio. The task can be completed without assistance. When shooting outside, select days with hazy sun rather than intense specular sunlight to avoid harsh shadows. Portable reflectors may be used to balance the lighting. The camera will most likely be powered with its own battery and extra fully charged batteries should be on hand. An external microphone with a direct wire connection is recommended rather than a wireless microphone which could pick up radio interference. For this production, a cue-card was mounted on the camera to keep the presenter's eyes focused on the lens and thus on the audience. Cue-cards were an integral part of the script and the card holder was designed to fit on the camera and accommodate the four scenes or cuts.

Video: The Tip of the Iceberg

While the video recorded lectures require a substantial investment in time, they have a relatively long (3–5 years) life if scripted and approved by the appropriate academic body. Another "if" is the stability of the course content. If the material comes from an established discipline (like the statistics material in the 801 and 802 courses) then the life of the recorded lectures is long. If the technology is emerging (like information technology) then the life of the video lectures is short. In either case, the ongoing effort in Distance Learning involves interfacing with the students in the education process. Without the vehicle of the live classroom such participation in the educational process could degenerate to nothing more than a "submit assignments and exams for correction" exercise similar to the correspondence school model advertised in magazines like Popular Mechanics. Major universities may not, do not, and will not follow such a simple model.

Using FirstClass

Chats. In the 801 scripts, references are made to "chat sessions" on a regular basis. For both courses, the chatting was done using a computer-driven approach and the FirstClass software supported by the Office of Distance Learning (ODL) at R.I.T. Chatting allows the professor to involve the class in the education process by offering stimulating topics that would be natural points of discussion during the lecture in a live class. The chats take place in the FirstClass chat room after the lecture has been viewed on tape. The chat room session also allows students to submit their own questions and comments for either discussion or an answer from the professor.

When to chat. Experienced instructors often can anticipate questions based on student inquiries from the past. Even in live classes, all questions do not arise and the professor usually offers them in the form of the question, ". . . you may ask why we divide by the number of observations . . ." or other phrasing that encourage class participation. Of course in a video the answer to such questions is not forthcoming from the student viewer, so the chat session serves as the asynchronous completion of this part of the educational process.

Scheduling chat sessions is contradictory to the advertised DL concept of "any time" although the student can be in "any place." This author established two chat session times on the same day. A late afternoon (3 PM) and a later evening (7:30 PM) session were almost 100% attended. The later session could accommodate students in western time zones who worked from their home computers. The earlier session was for students who were working from company computers as well as their home devices. If a student missed a chat, the text of the session was archived in a FirstClass message that was available for all to review if so desired. This archival storage of the classroom dialogue is an advantage of the on-line discussion not afforded by live class discussion. A typical chat session lasted from 1 to 2 hours depending on the need. Since the chat topics were sent out in advance of the actual chat session as a FirstClass message, the chat leader (the professor) could copy them from the message and paste them into chat dialogue box. This made the flow of the typed session easier. Since the same topics were covered in both sessions, it was possible to copy comments from the earlier session's archive and paste them into the later session keeping the level of information equal in both groups.

Evaluation

Student Testing

Testing was also accomplished via FirstClass. A quiz was posted in the class session and at first it was to be returned to a quiz folder with instructions not to read any other quiz in that folder belonging to another student on penalty of an F for that quiz. Later, ODL explained the use of a FirstClass tool called a drop box. This feature allows a message (like a quiz or exam) to be deposited in a folder much like a mailbox. The deposits may not be viewed by the depositors although they may have permission to see what is in the box to verify that their message got there. Another help in expediting the examination process is the use of the FirstClass "stationery" message. The quiz is created using the stationery form by the professor. The student opens the quiz and it becomes the fill in the blank form for his or her answers. It is automatically addressed to the drop box and sent there when the student is ready to deliver the exam. These automated features of the FirstClass system make the direct communication aspect of distance learning a smooth operation and simulates the live class feeling very nicely. This author felt he had managed to know the students by the end of the quarter in much the same way as in a live class.

Is the Learning the Same?

While DL is a challenge, is very much technology intensive, and is able to emulate the live classroom in certain ways; the real question is: "Do the students learn as well in the DL format as they do in a live class?" This author asked this question many time at faculty information meetings, during informational teleconferences held on the DL topic, and as a member of the R.I.T. Senate appointed Ad Hoc committee on Distance Learning (2). With very little in the form of statistical evidence concerning the effectiveness of the DL methodologies, it was time to gather the data to answer this question. Historical final grades from four prior years were compared to the DL final grades using ordinary statistical hypothesis test methods and no significant differences were found between these two samples for either course. Thus we may conclude that there is no difference in the learning between the DL format and the live format with regard to grades.

Student Evaluations of the Product

How do the students feel about the DL method? The student evaluations from the DL offering were comparable to similar student evaluations from live courses. In the question regarding the ability of the DL format to convey the learning, the students' replies tended toward learning more than in a traditional course rather than less. This is a very good indication of the effectiveness of the DL approach adopted in these courses. In a separate questionnaire devised by this author, the following four areas of particular interest to the approach taken in these two courses were investigated: Video Lecture; Chats; evaluation; and the project.

The video. The video was highly regarded (with a mean score of 8.2 out of 10). Of interest is the unanimous agreement that the video quality looked professional with regard to lighting, editing, etc.

Chats. Evaluation and chat sessions were next in overall score. These two activities were closely linked to the FirstClass software. While there were mixed reviews of the software, the students agreed that the chats and the on-line delivery of examination materials worked and aided the learning process. They also suggest that more enhancements to the software can make these processes better.

Project. The project fared the worst of the four topics. A 6.8 average rating (although the standard deviation was also the highest [2.37] indicating a wide diversity in these ratings) would indicate that more work must be done to enhance the project portion of the course. Yet, there was unanimous agreement that the project enhanced understanding and was a valuable part of the class. It may have been that the project was a lot of a new kind of work and the low rating simply reflected this fact.

Summary

This author's personal feeling on the learning accomplished via distance methods is very positive. In the final exam, the oral question was answered by the DL students (via the voice phone connection) with as much ability and confidence as the hundreds of students from the live classes of the past. Distance Learning, if done right produces learning that lasts, any time, any place.

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Autobiographical Sketch

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From Volcanoes to Virtual Tours: Bringing Museums to Students Through Videoconferencing Technology

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Constructivism in a Museum Environment

Development of a Constructivist-Based Science Gallery

Museums are taking on a more active role in the education of children. Science museums and other informal science centers such as zoos, aquaria, and environmental centers have increased in popularity because they provide opportunities that extend beyond the traditional museum. Bitgood, Serrell, and Thompson (1994) highlight a major advantage that informal learning environments have over the traditional classroom. These sites are often able to meld affective and cognitive learning experiences. In other words, children learn concepts through play. Another advantage is that children are able to control their "time-on-task," even though that time may be shorter, and more episodic than in a traditional classroom. Thus, children are more apt to pursue those exhibits which possess science content that is relevant and meaningful to them. In essence, museums provide a medium for learning that parallels the educational epistemology of constructivism. Constructivist beliefs assert that children's learning occurs when their existing understanding of a concept is challenged by an experience or phenomenon that cannot be supported by that understanding. The learner is forced to develop a new conception that is more useful, rational, and intelligible (Posner Strike, Hewson, & Gertzog, 1982). The role of education is to provide such challenges for the students.

Schauble and Bartlett (1997) explain that this constructivist notion provided the framework for the design, construction, and educational programming of the recently completed ScienceWorks Gallery within The Children's Museum of Indianapolis. Exhibits were created that could "build upon and extend activities first encountered at the museum into other contexts, such as the child's home, school or backyard" (p. 784). In addition to the physical design, the museum recognized that to truly develop a constructivist approach, children's involvement with the exhibits should occur with mediation and guided interpretations. In other words, children need to be talking with others about what they are experiencing. Gallery educators are encourage to answer inquiries, but more importantly, they are encouraged to ask visitors open ended and thought provoking question. Gallery interpreters are trained to be sensitive to the manner in which children think and learn while visiting exhibits. Less emphasis is placed on dissemination of factual content, with a greater significance being directed toward demonstrating those educational strategies that help guide children toward science understanding. In short, the museum is striving to apply classroom constructivist methodology to an informal science environment.

Incorporating a Constructivist Approach for Distance Learning

While the museum has experienced a great deal of success executing these beliefs for their on-site visitors, recent innovation in the use of two-way audio-visual videoconferencing as a means of sharing museum resources adds another, more complex layer.

Currently, the museum is struggling with the question: "How can an informal environment, built upon a foundation of free-choice exploration with mediated interpretations, promote meaningful and relevant experiences for school children via videoconferencing technology?"

The notion of "independent" would not seem feasible in a situation that requires students to remain mostly stationary and fixated to a central object of information presentation, the TV monitor. However, Jones and Knezek (1995) state that one of the true benefits of two-way audio/visual interactive learning (from here on referred to as "2WAVIL") technology is the "interactive" nature of the system. It provides a level of intimacy in communication that is not apparent in other forms of distance learning. Colbert, Voglimacci, and Finkelstein (1995) highlight that another strength of the technology lies in its synchronous nature; the teacher and learners experience parallel delivery and reception of information without a time delay. Finally, Jonassen, Davidson, Collins, Campbell, and Haag (1995) suggest that a constructivist epistemology can indeed be implemented through 2WAVIL technology. They state:

> Two-way real time video transmission of information implies a new definition of real-world context. Although video-mediated, constructivist learning environments could potentially include the actual environment or a close facsimile with which the learner could remotely interact. The collaborative problem-solving situations enhance knowledge construction through the addition of visual information and remote interaction with other learners. The video transmission of authentic, realistic contexts adds a significant dimension to anchored instruction and situated learning environments. (p. 18)

Creating Distance Learning Programs at The Children's Museum

In the summer of 1995, The Children's Museum was awarded a Two-way Interactive Video Distance Learning K–12 Curriculum Development Grant from The Corporation for Educational Communications (CEC). The CEC, a not-for-profit organization, administrates funding for Ameritech's Advanced Video Network entitled "The Vision Athena Project." This project helps schools take advantage of the new and evolving telecommunications infrastructure. The focus of Vision Athena is the creation of a learning community of K–12 schools, higher education, and cultural and corporate partners through a statewide fiberoptic network.

The grant covered costs for equipment and content development over a three year period. Equipment was placed in a dedicated distance learning classroom located in the museum's ScienceWork's gallery Additionally, the museum also possess a mobile camera and monitor unit. This unit can be plugged into fifty-four different receptacles located throughout the five-story gallery spaces and collections department house in the basement. These receptacles are wired to an in-house cable network located on the third floor. This central network serves as the head-end from which all broadcasts are received and transmitted via fiberoptic phone lines. This has provided the museum the capability to broadcast and receive transmissions from almost anywhere within its 250,00 square foot facility. Thus, any of the museum environments can be brought virtually to schools or classrooms that own the appropriate equipment.

Possessing the capability to provide the museum environment to remote locations does not guarantee that interactive teaching techniques will be executed in a manner consistent with constructivist epistemology. Appropriate mediation would need to occur to avoid a didactic approach or "talking head" mode of presentation. Therefore, the museum is currently in the process of creating and adopting various distance learning programs that can be transmitted to elementary and middle schools. These programs attempt to combine museum resources (such as gallery exhibits, collections and museum personnel) with a theoretical framework that models constructivist classroom teaching. To encourage and promote interactivity, the programs include a component of investigation and manipulation of content-related materials. All presentations utilize exhibits and/or artifacts from the museum's 105,000 plus item collections. Some of the programs even include sending artifacts and other materials to the participating sites prior to the 2WAVIL presentation. Thus, these traveling kits allow students to conduct investigations right along with the museum facilitator.

A Research Project That Examines Distance Learning in Museums

Rationale

The museum has discovered that 2WAVIL technology is a unique medium that requires different pedagogical approaches than those which are incorporated for on-site visitors. A search for foundational research to aid the development of these pedagogical approaches has been unsuccessful. The majority of research on 2WAVIL use has focused on implementation throughout the university realm. Few projects investigate applications at the high school level and virtually none exist for the middle or elementary school (Evjemo, Eidsvik, & Danielsen, 1995). Since the potential audience for the museums 2WAVIL programs will be at the elementary level, the absence of such research represents a serious snag in effective 2WAVIL programming construction.

Secondly, many of the studies have reported on cooperation among schools in which one district hires a teacher to broadcast daily lessons via satellite or cable telephone lines to other cooperating schools. While this is often accomplished in a very didactic manner with little interaction from the students, these courses do enable both teacher and learner to become accustomed to the medium (Bork, 1995). 2WAVIL programming created by The Children's Museum has not been used in the manner of a daily replacement setting for the classroom, but rather as a means for providing supplemental experiences for teachers that enrich and support their classroom curricula. Such experiences are often single connections that teachers have scheduled as an enrichment activity.

The museum has decided to approach this deficiency in foundational research by participating in a study which examines how 2WAVIL technology can be used to help prepare students prior to a museum visit. This preparation may enable students to interact with gallery exhibits in a more constructivist-like manner. There is a significant amount of information on the behaviors children exhibit while attending informal science settings. In particular, the behavioral reactions to setting orientation and novelty influence has been examined extensively. This has led some researchers to be concerned that the novelty, or excitement of a field trip, may interfere with task-directed learning. Children spend more energy orienting themselves with the environment than trying to understand the scientific concept being presented (Falk, 1983). In fact, some studies suggest that extreme novelty could even lead to less exploration and fear (Falk & Balling, 1982; Falk, Martin, & Balling, 1978; Martin, Falk, & Balling, 1981). Therefore, museums have created orienting materials such as: logistical layouts and agendas given pre-visit, information panels placed anterior to museum exhibits, teacher pre-visit discussions, cognitive preparation materials related to the exhibits, and slide-tape presentations given pre-visit. The purpose of these advanced organizers is to help better prepare students for their museum visit. For example, Kubota and Olstad (1991) introduced a pre-visit novelty reducing treatment via a slide tape presentation of the logistics and highlights of a science center. Their positive outcomes suggest that a two-way audio-visual interactive learning (2WAVIL) videoconference could produce similar results for an elementary audience.

Objectives of the Study

The purpose of this research study is to examine how children and their classroom teacher interpreted a visit to an informal science museum, The ScienceWorks Gallery of The Children's Museum of Indianapolis, following a two-way audio-visual interactive learning (2WAVIL) link. This link, which occurred three days before the museum visit, was broadcasted via the Vision Athena network. This form of "virtual tour" was meant to serve as a novelty reducer for children so that they could better focus on the concepts being presented by museum exhibits. The study examines the influence of a 2WAVIL link on children's "lived" experience at an informal science setting. Specifically, the study addresses the following questions:

- What are children's interpretations of their experience in a novel science museum setting and the 2WAVIL link which preceded it?
- What is the classroom teacher's interpretation of those children's experiences?
- How do the children's and teacher's interpretation of this experience compare?

Design and Procedures

This interpretive study involved a the ScienceWorks Gallery of The Children's Museum of Indianapolis and a fifth grade classroom located 150 miles north of the city. Four elementary children and their teacher in that classroom served as key informants for data collection purposes. Data was gathered through interviews with the key informants, as well as through observations, field notes, and researcher reflections. Data is being interpreted through the development of common themes generated from the interviews and is being synthesized into assertions about the nature of the experience. These assertions are being triangulated with the other three types of data to strengthen the nature of the study. Member checking techniques are being employed with the classroom teacher as a further means to verify interpretations.

Interviews were utilized as the primary data source. An interview was conducted with each key informant following the initial observations but prior to the 2WAVIL link. A second set of interviews occurred immediately following the 2WAVIL link but prior to the museum visit. The third and final set of interviews occurred following the experience at the museum.

Preliminary Results and Findings

Even though the goal of this study is to examine this notion of novelty and the role of an advanced organizer within an informal science setting, one of the limitations was that it also had an inherent second form of novelty, the actual use of the 2WAVIL technology. Since this form of communication is just emerging in the education arena, it is something with which most children and their teachers are not familiar. The use of the communication system could have inadvertently influenced the behavior of the children when they were exposed to a technology in which "they talk to the TV and it talks back." Students may have focused on the novelty of this phenomenon, which could serve as a distraction from the content presented in the distance link experience. This second form of novelty may produce some more interesting findings interwoven within the project design that can be further investigated throughout the data analysis. The interpretation of the data may need to take into account that the students and the teacher may not be responding to the information presented in the link as much as to the workings of the technology.

Preliminary review of student and teacher interviews would suggest that the technology was effective in orienting the students to the gallery environment. Such findings would support the core body of research that iterates any type of advanced organizer will have some positive cognitive and/or affective outcomes. Mrs. Jordan, the fifth grade teacher saw the immediate benefits: "I think it was definitely a positive link to them learning and knowing about what they were going to learn. To actually be in before getting there" (Interview, 11/18/97). Derin, a student key informant, shared a similar reaction to the museum visit which also highlights this notion: "It (the museum) was better than I thought. Cause I was thinking we'd just go through and go to a few different things. But it was really, really neat to be able to be there and do all the stuff we seen on TV" (Interview, 11/18/97).

Derin's comment regarding the type of media used as the advanced organizer provided an interesting finding on the nature of such interactive media. All interviewees felt the opportunity to interact with me added to the excitement of the link and the subsequent trip. When asked to compare the 2WAVIL link with a video-taped tour of the gallery, all emphasized that the ability to ask questions and speak with the tour guide "on the spot" would make a 2WAVIL link more motivating. Interviewer: "Now when we did the distance link, do you think this would have been the same as if I just would have brought in a video tape and showed it to you?" Mitchell (a Key Informant): "No, not really, cause we could actually talk to you, when you were down in Indianapolis, you could talk to us . . . and see us and everything" (Interview 11/18/97).

These same reflections were shared by the Mrs. Jordan who also believed that this was one of her most successful field trips. She feels this is so because many of the students came prepared with a plan of action for their visit. "I think the way you walked through it really put the puzzle together in their mind" and "They knew what they were looking for, they searched things out in all areas" (Interview, 11/18/97).

Preliminary Implications

The results and conclusions of this project will help provide a better understanding of how children think and learn in informal science settings. It will also help extend previous studies done on novelty reducing preparation in informal learning environments. Additionally, this particular project can serve as one of the few studies that examine the outcomes of using 2WAVIL technology in a classroom and in an informal setting.

The conclusions drawn from the project will have implications for the educational establishment's current push toward the integration of advanced technology in the classroom. It will provide a basis for further studies that implement distance learning technology. It will also provide information for schools and museums that are just beginning to equip their buildings with 2WAVIL technology.

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Autobiographical Sketches

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Teaching Mathematics, Science and Technology on the Internet: A Workshop (Description) for Educators in the New Millennium

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The new millennium will bring a change in the educational environment that will, in turn, alter the traditional student-teacher relationship. Advances in technology, academic research, and the increase in the chronological age and personal commitments of the average college student are contributing factors to the metamorphosis in the traditional structure of the educational environment (Newman 1996; Johnstone & Krauth 1996).

Progress made in the fields of computer hardware and software is encouraging colleges and universities to offer courses via distance learning programs (Means 1993). These programs include courses that are online on the Internet or at least include a substantial online component (Ben-Jacob & Tucciarone 1997; Hiltz 1995; Saba 1996).

The differences in the media and format used directly affect the relationship between instructor and student. The role of the professor or teacher is changing to that of a facilitator as the model for education moves to student-centered prototype.

The online teaching and learning of material are still in relatively innovative stages. There are still many questions to be answered and issues to be discussed to insure that online education remains a possible means of gaining knowledge and receiving formal confirmation of it (Johnstone & Krauth 1996).

The use of distance learning technologies for instruction is growing and institutions of higher education are adopting interactive technologies. We need to insure the integration and success of the new media and formats into our learning environments. As such, we plan to run a four day workshop for college and university faculty to provide instructors exposure to the workings of a successful online educational system, to open up for discussion such issues as what type of technological enhancements would facilitate the online teaching of mathematics and science courses, which have proven to exhibit unique characteristics that need not be addressed in a social science or a humanities course; we will address how one must compensate for the lack of social interaction that is often a motivating factor in the traditional classroom when one cannot read the expressions on the faces of the students. In addition, we will consider the following: the level of integrity with regard to a student's work in an online course; the appropriate amount of rigor for an online course versus that of the traditional undergraduate/graduate course; the further exploration of the issues of evaluation and assessment (Ben-Jacob & Tucciarone 1997; Johnstone & Krauth 1996). One of the most fundamental distance learning questions is the one with regard to course content: Should the course content be adjusted to the medium or just relayed in the new fashion (Burgstahler 1997).

We are interested in problem-based learning and collaborative learning, both with regard to students in an online course and our workshop participants (Albanese 1993; Hiltz 1990). We believe a camaraderie will be formed and maintained by our participants; this is very essential as our corps of participants will mostly be coming from small institutions that are in their early stages of their distance learning programs, and that may not have large research groups. We will encourage the participation of women, minorities and handicapped persons, who are sometimes underrepresented among research science groups. The workshop will help insure the future success of the virtual university by forming a network of academicians who will continue to brainstorm upon their ideas and knowledge, and those presented at the workshop with regard to the teaching and learning of mathematics and science on the Internet (Turoff 1995).

This paper describes our workshop, which will be sponsored in part by a National Science Foundation grant.

Workshop Content

The Teaching and Learning of Mathematics and Science on the Internet Workshop will incorporate lectures, interactive discussions between presenters and participants, a panel discussion, hands-on, assisted laboratories, and open labs. It will serve as a forum for the concepts and issues relevant to successful online education, particularly for mathematics and science. The workshop will not try to exhibit an in-depth analysis of one particular mathematics or science course. Instead it will give an overview of what the online courses have in common, and what issues are unique to each subject. It will allow for the examination of MerLIN, the Mercy College Long-distance Instructional Network and discuss its features. It will allow for the generic topics that pervade virtual courses and the special considerations that one must give to mathematics and science courses. Guidelines for assessments, homework, examinations and projects will be examined. Participants will learn how to obtain information about distance learning from the Internet.

The following components will be integral to the Workshop:

- Discussion of a running, online educational system and hands-on laboratory sessions using MerLIN. Further discussion of the necessary features for such a system to be successful.

- Presentations of how certain courses were presented when taught online. A comparison with the same courses in the traditional classroom setting. We will have a session dealing with mathematics, computer science, computer information science, physics, chemistry, and biology.

- A panel comparison of the advantages and disadvantages between the traditional classroom and the virtual classroom. Included on this panel will be a brain researcher, a psychologist, faculty with contrasting views of online courses, and a student who has taken courses on MerLIN.

- A discussion of what type of pedagogy is most effective for the different approaches to teaching and learning online and offline

- Assessment

- The change (if any) in the psychology of teaching online versus that in the traditional classroom
- The methods needed for increasing cooperation among students and instructors using this medium
- A plan for continued interaction among the participants after the workshop
- A plan for disseminating the contents and results of the workshop

Content of a Session on a MerLIN Course

In his/her workshop, each leader will include the following:

- A detailed explanation of how he/she taught using MerLIN
- The differences between the content of the online course and its traditional classroom equivalent
- The differences between the examinations and projects of the online course and its traditional classroom equivalent
- Which features of MerLIN were used
- What additional capabilities he/she would like to see in a distance learning system
- His/her opinion of the difference in the amount of knowledge gained by the students in the online course versus the students in a traditional classroom setting
- How he/she compensated for lack of face-to-face interaction
- His/her projection of the future of distance learning in general, and specifically at Mercy College
- Why he/she is or is not a supporter of distance learning
- Why students are pro/con distance learning
- Open discussion

Laboratory Sessions

In the scheduled laboratory session, participants will learn how the MerLIN system works and how it has been used and is being used for courses in mathematics, and the sciences. Participants will be able to carry out the interaction required by an instructor and a student from both the perspective of the student and the instructor in an online course. They will critique the resources and suggest improvements from the perspectives of the media facilities, the pedagogical content, and the course content. In addition, they will become familiar with the Internet and how to locate resources relevant to online teaching. The

Director and/or the Assistant Director of Distance Learning and faculty leaders will be present during the laboratory sessions. Student assistants will also be available to help.

Curriculum Projects

At the conclusion of each session, we will ask for the participants' input with regard to the session and suggestions for possible improvement We will encourage them to record their ideas, since on the final day of the workshop, they will be asked to work in groups and suggest responses to the following issues:

- Course content of an online course versus the content of a traditional course
- Evaluation of the student work in an online course
- Overcoming the lack of face-to-face interaction
- Lowering of the withdrawal rate from online courses
- Increasing student online participation in a course, particularly with regard to collaborative learning with the other students
- Determining which type of student is most likely to be successful with online learning, and how to increase the success rate of other students
- Identify the necessary software capabilities to facilitate online instruction.
- Enhancing the future interaction and networking of the group of participants

Group Discussions

Group discussions are an integral part of the Workshop and will take place after each session, including the labs and the panel discussion. The participants will be encouraged to address the following issues, as well as others that are on their minds:

- How familiar with computers should an online student be?
- Which type of student will be most successful online, and how do we encourage other students to participate successfully?
- How do we assess students in online courses?
- How, if at all, should we alter our methods of information delivery and our teaching styles for online courses?
- What are the advantages and disadvantages of online courses, for the institution, the professor and the students?
- How do we integrate ultimate cooperation between the student and the professor?
- What are examples of appropriate online assignments, projects, and exams?
- How do we insure academic integrity in the online learning environment?
- How do we expand the network of those persons committed to the new ways of imparting information?

The goal is to have faculty participate who will make the most significant improvements in online teaching of mathematics and science courses at their institutions. Preference will be given to those who come from smaller institutions that have shown serious interest in establishing online courses as an option for their students or who are in the early stages of their distance learning programs. We feel these people will have the most to gain from the Workshop Priority will be given to colleagues of institutions in the northeast region for the first Workshop because we will tap on our local contacts for recruitment. We hope the network formed by the participants will be tight. Our core network will be strongly bonded. Having participants from the same, somewhat local geographic area will facilitate participation at the follow-up workshop in the Spring. The following year we will recruit nationally for the workshop, and deliver the entire workshop online. After all, the ultimate distance learning workshop should epitomize distance learning at its best!

Follow-Through Activities

The Teaching of Mathematics and Science on the Internet Workshop at Mercy College will yield several products which will, together, comprise a packet of materials to be used at this and other institutions. The questionnaires completed by participants will yield data which will form the basis of study-papers, the first of which we will prepare during the summer of 1998. This first study paper will be comparing pre and post workshop results, and will include suggestions for institutional services necessary to enhance support and information for this mode of teaching. We will videotape sessions of the workshop and during the summer and fall of 1998, these tapes will be edited into one sixty-minute tape. This tape, along with the study paper and other pedagogical and technical materials that we will collate, can be used as reference material for the participants and others, and can serve as the basis for mini-workshops, or faculty seminars at different institutions.

Follow-through activities are of significant importance to all workshops, and particularly so for the one we propose as we envision the online teaching of mathematics and science courses as being in its innovative stage and as an evolving process. Many of the faculty participating will not be affiliated with major university and will benefit greatly from the interaction with colleagues. Part of the packet provided to all participants will include the surface and e-mail addresses and the telephone numbers of the other participants. Participants will remain in contact to share ideas and pedagogical material based on actual experiences. In addition, we plan to design and set-up a repository so that all participants can easily keep abreast of information related the teaching of mathematics and science on the Internet.

An additional way of expanding our extended coterie is the inclusion of two of the participants as leaders of discussion groups in the workshop the following year. Their participation and sharing of experiences would exemplify how the workshop's material can be implemented in other environments. It would also serve to expand the network formed by the participants, and those actively interested in promoting the future of the online university.

We plan on having a one-day follow-up workshop during the Spring of 1999 to assess the impact of the Workshop. The participants will share their experiences in integrating the material into their courses at their institutions. At this time, a third evaluation will be completed by the participants to assess the impact of the workshop on their teaching and curricula. A second study-paper will be written based on these results.

Evaluation and Dissemination

The Teaching of Mathematics and Science on the Internet Workshop is to disseminate information in a context that maximizes the likelihood that participants will retain and act on the information received. Therefore, in our evaluation component, we must determine (a) whether participants have, in the course of the workshop, become aware of new information relative to the teaching of mathematics and science on the Internet, and

(b) whether they are likely to integrate what they have learned into the appropriate courses they teach at their own institutions.

To gather this information, we will ask all participants to complete three questionnaires, one as part of the Workshop application (pre-test) which will measure the level of participants awareness, and experience before the Workshop, one as part of the Workshop's evaluation which will be filled out at the conclusion of the workshop (post-test) and will measure any growth in awareness, and finally, one during the follow-up Workshop in the Spring of 1999, measuring the participants' integration of the information gleaned into their own courses at their own institutions. These will contain both short answer and open-ended questions to allow for greater detail.

The questionnaires to be completed at during the Workshop will also serve as a critique of both the content and format of the Workshop. Based on these results, the Workshop will be modified the following year.

The new millennium brings with it a change in the academic environment. The relationship between teacher and student will undergo a transformation, and we, as educators, are obligated to facilitate this transformation. A workshop that brings educators together to brainstorm upon ideas and information, and form a pedagogical network is one way of insuring the success of higher education in the 21st century.

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Collaborative Learning:
A Critical Success Factor in Distance Education

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Two trends, one in pedagogy, and the other in technology are converging to make distance learning environments of the twenty-first century meet the needs of both the instructor and the student. The new millennium brings with it an innovative model of learning for the environment of all areas of education, in business and industry, in college and the university, in government and the military, and in vocational training, to name a few. The roles of the teacher and the learner will be changing and the need to incorporate collaborative learning into this model is fundamental to ensure educational success.

An integral component of education in the next century will be collaborative learning because it supports active learning and also, because the workplace, for which we prepare our students, requires collaboration. It is evident that as corporations become global, collaboration will be mediated by technology. Shifts in learning theory challenge the lecture-test-exam model of learning and indicate that learning is achieved when the learner is actively engaged in the creation of knowledge rather than the passive recipient of information. The new model contends that learning is best achieved by interaction between learners and instructors and between learners and learners.

Recent developments in instructional technology have led to new trends in distance learning that are suited to the active model of learning, provided their use is accompanied by appropriate shifts in teaching strategies. Both Mercy College and DePaul University support distance learning programs. The design of the courses within these programs is different, yet, the pedagogical shifts necessary for the achievement of successful learning outcomes in both these environments are similar. The link is so strong that the presenters will be measuring the effectiveness of technology mediated collaborative learning activities of their distance learners using the same instruments and similar activities. The presenters will reinforce the critical role collaborative learning plays in the distance learning environment and share their strategies and techniques.

MerLIN, Mercy College Long-distance Instructional Network has its courses' underlying framework as forums. For each forum, the professor can post public messages arranged in threads of conversation that include discussion of topics, homework assignments, answers to questions posed, etc. Private discussion between lecturer and student or students can take place via e-mail. Additional features of the system include teleconferencing for live type in sessions, including online office hours between professor and students, and file libraries, which are documents for users to read online or copy to their computers.

At DePaul University, many academic programs are committed of fully integrating the use of technology into the students' learning experiences. Computers and the Internet are used extensively to provide students with online academic resources; the ability to communicate with instructors, peers, and "visiting" content experts through the use of e-mail listservs, electronic discussion groups, and chat rooms, and a full set of online student support services. DePaul makes use of interactive video through a network of video room on four of its campuses. Many of the interactive video courses make extensive use of computers and the Internet of supplement the classroom experience.

The new technologies for distance learning described here—interactive video, computers and the Internet—have the potential to provide a learning environment that can support active learning, but only if they are married to important shifts in teaching styles, content delivery, and learning activities. Without these changes interactive video courses simply allow instructors to lecture to multiple sites simultaneously and Internet courses are just correspondence courses by e-mail.

At Mercy College, Ben-Jacob teaches Discrete Mathematics using the MerLIN system. E-mail is used for individual communication between students and the instructor. Discussions of how to solve problems, problem sets, partial solutions, and final solutions are posted in forums. For some problem sets, students are encouraged to post partial solutions to the forum for comment and review by their peers. This results in students learning multiple approaches to solving problems and in learning by teaching. Each major topic is introduced with a question that can be answered by the students without specific prior knowledge of the subject matter. Ben-Jacob has taught this particular course before both online and in the traditional classroom setting. In the past, in the traditional classroom, she has always been able to cajole the reluctant student to express at least an opinion with regard to the classwork; online, however, if a student is reluctant to post an opinion and chooses not to respond to the forum posting, it has proven difficult to get him/her to participate. Most of the students in this situation have admitted their reluctance stems from the fact they are not sure their responses would be correct. To overcome this, the initial common sense or "thought" question is posed. As a prime example, prior to introducing the subject of logic, the students are asked to discuss the differences and similarities between three very short logical arguments. Two of the arguments are logically equivalent but do not use any of the same words in their propositions. The third argument, which is different logically from both of the others, uses the same words that appear in one of the former arguments. The students are advised they do not need to read the text to respond, they are to use their intuition, and that we are looking for their opinions, not "right" or "wrong" answers. Another pedagogical tactic employed in the online course is that of posting a request for peer help with a problem before Ben-Jacob solves it. Discussion questions are well suited to a distance learning course. Ben-Jacob has found that the more technical the online course is, the more reluctance there has been on the parts of the students to engage in online exchanges, and the greater the need for her to facilitate the beginning of the discussions.

At DePaul University, Levin teaches Ethical and Social Issues in Computing. This course is taught at two of DePaul's campuses using interactive video and makes extensive use of the Internet. In order to make the classroom discussions interactive each class period has at least one planned student delivered program from each of the two class sites. This may be a summary of an article, a presentation of individual or group work, or a debate of an ethical issue with the proponents at different sites. The course has a web site that contains links to many content resources that have been identified and annotated by students as well as the instructor. The course uses HyperNews, an asynchronous computer conferencing system, for required online discussions. We have two types of discussion: topic discussions and discussions of readings. Over the course of a quarter each student is required to summarize one reading assignment in the readings discussion group. Students are encouraged to post "I don't understand why the author says this" messages in this discussion. While students, especially the summarizer, are encouraged (awarded extra credit points) for posting good answers to these questions, the instructor usually answers these questions. Nevertheless, by using this time and space for initial discussion of the readings, students come to class well prepared.

The instructor posts opening questions in the topic discussions. These questions typically encourage students to take a position on an issue. In the course of the quarter each student is required to post a minimum of five initial responses to a topic question and respond to at least one topic thread (discussion initiated from an initial response) each week. A new topic discussion is started each week and lasts two weeks. After the first two weeks, the instructor does not directly participate in the topic discussion beyond posting the initial question. Instead suggestions, feedback, encouragement, and assessment are provided to authors directly by e-mail. This allows the students to take full ownership of the discussion. With a few minor exceptions students contribute far more than the minimum to these discussions.

In order to provide meaningful experiences in distance learning environments we believe instructors should act as models and facilitators. The distance learning environments, whether the Internet or interactive video, may not be a forums in which the student feels comfortable conducting an intellectual conversation or doing work. It is important that show the students how to do this. However, it is equally important that the instructor knows when, after modeling the behavior, to "step aside," allow the students to take ownership of the conversation, and assume the role of facilitator. We would like to model each course beginning with the professor acting as the hub of a wheel composed of students as the spokes. As the course progresses, the professor should remove him/herself from the center of the wheel and serve in a consultative or facilitator capacity to stimulate dialogue and to pose questions (Ben-Jacob & Tucciarone, 1997).

In general, of course, students need a clear understanding of what is expected of them and the objectives and outcomes of each activity. These needs are heightened in the distance learning context where nonverbal means of communicating uncertainty or discomfort are not possible.

Collaborative learning is one of the activities we believe critical to the success of students in the online learning environment. We are currently conducting a study of the effectiveness of student collaboration in online environments. Although Ben-Jacob has taught Discrete Structures both online and in the traditional classroom setting before, the Spring semester of 1998 will be the first time she will be teaching both the traditional and Internet sections concurrently. This will allow for a closer comparison of the two learning environments. She will be covering the same material and giving the same type of examinations and projects to both classes. This particular course at Mercy College is a junior level achievement course. As such, it is used to evaluate the students in the competencies of written communication, logical thinking and quantitative reasoning. To date, this has been done via a semester project that each student completes individually. This semester, however, Ben-Jacob will assign two such projects to students in both sections. One will be done individually and the second project collaboratively. For the team project, students in the traditional section will meet face-to-face, while students in the Internet section will use e-mail for their collaboration. Students will be asked to describe and critique their own and their partners approaches to problems; they will be evaluated with regard to all the competencies. In the Winter Quarter at DePaul University, students in Levin's Ethical and Social Issues in Computing will work collaboratively in groups of three on projects. Half of the teams will meet face-to-face to work; while the other half will use e-mail, HyperNews, and the DePaul Annotator, a web-based tool to support annotation of text, graphics, audio, and video. The product can take the form of a traditional text document, a hypertext document, or videotape.

Future research plans include a distance learning course jointly offered by both Mercy College and DePaul University. Learning groups will be formed in such a way as to include a mix of students from both institutions. Of course, surveys to measure student opinions and levels of satisfaction will be administered.

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Student Orientation in the Distance Education Classroom

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Abstract

Institutions offering distance education courses realize the value that well-trained and well-prepared faculty contribute to the success of their distance education programs. However, taking approximately a half-hour in the first session of any course to prepare the students for their distance education experience will also add to the success of the course. Such student preparation establishes

- reasonable student expectations,
- the theme of a learning community,
- the parameters of learner responsibility, and
- the "rules" of the classroom.

Having someone other than the designated class instructor deliver this orientation allows the instructor to develop rapport with the students since all are hearing this information together. It also allows the instructor to reinforce what was covered in the orientation as students begin assuming their responsibilities.

During this presentation the participants will brainstorm the various roles of responsible students in the distance education classroom, discuss the advantages of a student orientation program, and view the student orientation presentation currently in use at the University of Wisconsin-Eau Claire.

Introduction

Well-trained and well-prepared faculty contribute to the success of any distance education program. As one faculty member new to distance education teaching put it, "To train or not to train is not even a question. . . . It will make all the difference when that first class period arrives." (Dobie, 1998) Much has been written and presented on what faculty need to know to accomplish a successful DE teaching experience; in fact, the more time that is spent up-front, working with faculty the greater the degree of comfort and confidence they show, and that confidence, in turn, leads to success in the classroom (Bergmann and Raleigh, 1996).

Distance education students, on the other hand, are often expected to show up and adapt. They may not even know the class for which they registered is offered via distance education and, even if they know, they may be totally unfamiliar with a distance education classroom environment. A room filled with cameras, monitors, and microphones becomes immediately intimidating. In addition, for students at the remote sites, the instructor is not even three-dimensional, in fact, depending on the size of the receive monitor, he or she may appear as far away as a 6:00 p.m. newscaster. Even if the students are at the origination site with the instructor present, they become instantly aware that his/her attentions will be divided between them and students at other locations. It is common for students who are new to distance education to express lower expectations and to assume a decreased quality of learning merely because the class is a distance education offering. These perceptions, however, when tested, often prove erroneous (Seamons, 1987; Beare, 1989; Russell, 1989; Jurasek, 1993; United States Distance Learning Association, 1998).

Preparing Students for Their Distance Education Experience

In the same way that faculty must be prepared for their new role in distance education, so must students be prepared for their role in a distance education class. For the last two years, the University of Wisconsin-Eau Claire has used a student-focused classroom orientation session for the distance education courses. This session, conducted during the first class meeting by a member of the same team that provides faculty training, has proven advantageous for several reasons:

- Bringing in an "expert" emphasizes the importance of student orientation.
- A presentation by someone other than the instructor allows "breathing space" for the first-time instructor. It provides a model for both instructor and students to follow.
- If any technical difficulties arise during this first class session, the support person has the opportunity to model appropriate crisis behavior.
- Having a third party present the student orientation session allows the instructor and students to form a learning group; the faculty member is well-positioned to provide positive feedback when students exhibit appropriate behaviors suggested in the orientation and gentle reminders when students need to recall distance education etiquette.

In the half hour student orientation presentation, the team strives to meet three specific outcomes:

1. To increase students' comfort level with the equipment.
2. To raise students' awareness of their responsibilities as learners.
3. To involve students actively in the class as they test the equipment and begin to assume their responsibilities as learners.

For students to become comfortable with the equipment they need to know what it is and how it works. They need to be able to hear common distance education jargon and use terms such as "remote site," "panning and zooming," and "document camera." They also need to know how to interact with the equipment. They must know how the microphone works (sound-activated or push-to-speak), how loud they must speak to be heard, when they should begin talking, and the impact of their extraneous conversations. Many students are shocked when they see themselves on camera for the first time and shy away from such experiences. Having them recognize that the on-camera experience is simply a "given" for a distance education class and reassuring them that they will get used to seeing themselves as the semester progresses is essential.

As the presenter introduces the concept of learner responsibility, a metaphor to a five-piece puzzle emerges. Each puzzle piece represents a learner quality; taken together, they complete the picture of a successful distance learner. Qualities include patience, persistence, punctuality, presence, and participation. A PowerPoint presentation provides definitions and examples of each.

Dr. Tom Kubala states, "The problem commonly associated with traditional distance education is the lack of opportunity for collaborative work, debate, dialogue, and conversational learning" (p. 72). The student orientation session dispels the idea that this class will be non-interactive. Discussion during the PowerPoint presentation begins to involve students in the class. To continue this involvement, the students are asked to come to the teaching station and introduce themselves. This can be handled in a variety of ways but often includes some of the students using the teaching equipment. The number of students who speak and the time allotted will vary from class to class. Some introduction strategies include the following:

- Having the students "sign-in" and then take a minute or two to provide some personal data. This involves switching between the document camera and the teacher camera.
- Having students pull something from their wallet or purse that they use in describing themselves. Again, this makes use of the document camera and instructor camera. They also get to practice zoom and focus.
- Having students work in pairs to learn about each other and then introduce each other to the larger group. Students practice zooming, panning, and focusing the teacher camera or use the student camera to focus on their partners as they give the introduction.
- Having each student receive and reply to a question about himself/herself asked by a student at another site. This initiates inter-site conversation.

Actively involving the students early in the first class session increases their comfort level, convinces them that they can be seen and heard, makes them more aware of appropriate speaking levels and speaking times as well as inappropriate speech (whispering, etc.) It serves to gain understanding and empathy with the instructor and establishes classroom inter-activity from the beginning. Students can begin connecting with one another and form the basis of a learning community by revealing common interests.

Any student beginning any class wants information on class procedures, especially how to contact the instructor and how absences will be handled. In the distance education classroom, these items take on an added dimension. While the orientation team can provide a general reduction in anxiety, the instructor, by addressing these class specific issues, increases the overall comfort level for the students. The instructor needs to provide more than an office location. An email address, a phone number (especially if an 800-number is available), and a fax number will indicate to the students that they have options when needing to reach their instructor. Designated on-line office hours or phone-in office hours plus a guaranteed response time for electronic mail help provide necessary accessibility.

Students experiencing the distance education environment for the first time may be leery about missing class for technical or weather-related reasons. What if there is a glitch? What if a blizzard affects one site but not the originating site? Establishing a video taping policy for emergencies and explaining the policy during the first class eases these concerns.

The orientation team can set a mood of inter-activity which the instructor can capitalize on by expressly engaging the students in an activity during this first class session. This demonstrates that the active student involvement, begun in the introductions, will continue throughout the class. During this first session, the instructor can also provide feedback to the students as they participate. For example, a gentle reminder to state name and site when commenting will soon establish the habit for all the students. An enthusiastic response to a student comment may encourage other comments.

Comments From Students

One class of twenty-one students who received the distance education orientation adapted easily to the technology and their enhanced student role. At the end of the class, there was only one student who was still saying, "I hate seeing myself on TV." For the others, this had become second nature, and its value was reinforced by a student saying, "I really appreciated having the camera focused and zoomed on the student who was speaking; we could see facial expressions and everything." The students in this same class developed a conversational relationship between the sites. They would ask each other questions, provide follow-up comments, and share anecdotes all without instructor intervention. One student remarked, "I thought we would feel isolated from the students at [the remote site] but that wasn't the case; we were one class, not two."

Following the orientation appropriate student behaviors were reinforced early and often. If one site could not hear properly, students spoke up immediately so adjustments could be made. Class continued promptly after the breaks. Students used first names from site-to-site by the third week of class.

Another interesting result of the first class orientation is the attitude of students who find themselves in a second distance class in a future semester. Those students are often ready to volunteer what they learned the first time around; they can usually recount at least four of the five "P's." In fact, one early-arriving student came to the aid of the orientation leader as the leader discovered her disk was defective. The student announced, "I think I can help," and reached into her book bag to pull out a handout of the presentation from the previous semester.

Future Issues for Student Orientation Sessions

As students enroll in a second distance education class they may be willing assistants in the presentation; however, as they take a third or fourth class, they will likely get tired of spending class time this way. How, then, do the students new to distance education receive the orientation they need without boring the continuing students?

Another issue related to student orientation is the instructors' willingness to devote class time to this activity. While this is already an issue in some cases, most first-time instructors are willing, often eager, for the first-night support. Instructors who have taught in this format before may have forgotten how nerve-wracking the first session can be; they may overlook the fact that this is still "a first" for the students.

Conclusion

With proper preparation students will recognize a distance education class as an exciting learning experience in a positive learning environment. Establishing a comfort level for students as well as defining learner responsibilities and expectations helps learners prepare themselves for participation in a new learning community.

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Autobiographical Sketches

Marilyn Bergmann is a lecturer in the English Department at UWEC. Since 1992, she has been teaching the Introduction to College Writing: English 110 course to high school students via ITFS (a one-way audio, two-way video distance education system). She is currently involved in developing and conducting the distance education training program at UWEC and in facilitating a distance education interest group on campus. She has presented introductions to distance education for faculty and administration groups at Eau Claire as well as for local business leaders through the university's Business Advisory Council and the Chamber of Commerce. Marilyn also serves as the Instructional Technology Coach in the College of Business where she helps faculty convert courses for distance education. She conducts workshops for UWEC Business Extension and has authored several articles on business and on distance education topics.

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Using Web-Based Conferencing in Post-Secondary Instruction

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Institutions of Higher Education are currently caught up in the whirlwind of new electronic technologies, and wide-spread discussion is centered on the concept of the virtual university, the topic of university's role in providing distance education (Guernsey & Young, 1998). Regardless of the position one takes in these discussions, the fact is that electronic technologies are here to stay, and from now on they will impact the ways universities do business, the way faculty teach, and the way students learn.

One of the most popular and powerful electronic tools that has become available in the recent past is web-based conferencing, which takes advantage of the combination of file server storage capabilities and web browser capabilities to allow faculty to create discussion forums in which users can send and receive text messages in order to conduct groups discussions.

A number of commercial and freeware conferencing programs have been developed, each with it's own strengths, weaknesses and unique features. Among the most popular commercial conferencing programs are AltaVista Forums, TopClass, WebBoard, WebCT, WebCrossing and Caucus. The most popular freeware conferencing programs include Conferencing on the Web (also known as COW), Discus, COCO Board and BBMatic (Woolley, 1998).

The purpose of this paper is to highlight features, uses and training issues related to a particular web-based conferencing tool, AltaVista Forums. This paper will provide an overview of the features of AltaVista, identify a few techniques the authors have used or observed for integrating AltaVista into courses, briefly discuss training strategies for teaching faculty and students to use AltaVista, outline student and faculty reactions to AltaVista, and indicate a few advantages and disadvantages of the AltaVista conferencing system.

Overview of AltaVista Forums Web-Based Conferencing

Because AltaVista conferencing takes place via browser (as all web-based conferencing does), learners are able to access the conference via any client machine (Macintosh, Windows and Unix). To access an AltaVista conference, learners enter the Uniform Resource Locator (URL) of the conference, which typically is housed on a university fileserver. Once learners have accessed the conference, they will either be asked to log-in in order to access the conference, or they can choose to access the conference anonymously. Upon entering the conference, the learner can actively participate in asynchronous on-line discussions.

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In addition to the conferencing feature, AltaVista Forums offers a number of other features, some of which include: chats, which enable learners to conduct synchronous discussions such that the learners are all on-line discussing a topic at the same time; document attachments, which allow learners to post papers that others can download to their own computers; URL posting, so that learners can share access to other on-line sources by simply clicking on the web address; a calendar feature allows learners to post their personal schedules which facilitates scheduling when working in teams; mail-to listings allows learners to send a private e-mail to any other learner in the conference; and a feature called "newspaper" allows posting of articles that are of interest to the entire conference (Digital, 1998).

The University of Indianapolis has purchased a license to use AltaVista Forums, and at the time of this writing, Indiana University was negotiating the purchase of a license after a successful one-year pilot test. Digital advertises AltaVista for $4,000 for an unlimited use license. However, Digital provides an 80 percent discount for educational institutions, therefore, it can be purchased for $800. The annual maintenance fee is $200 per month. AltaVista runs on Windows NT, Solaris and Unix servers.

Integration of AltaVista in Post-Secondary Education Courses

In courses at the University of Indianapolis and Indiana University, AltaVista has been used to conduct learning activities such as posting information, content discussions, case analysis, group projects, and simulations. Faculty have used the forums to facilitate any-time, any-where interaction between the instructor and learners, between learners and other learners, and between learners and specialists in the field.

While web-based conferencing may be used as a sole means of instruction, in the experience of the authors, it has been primarily used to augment instruction. Conferences have been used to enable students to work in groups to discuss real-life case studies. Closed discussion groups have been created within conferences, allowing student teams to privately collaborate, share resources and discuss their projects.

The conference facilitator has the capability to create closed conferences or to open the conference in order to allow for anonymous participation. In this case, other faculty members or content specialists can join the conference to have discussions with and answer questions posted by students.

Web-based conferencing has also been used to provide learners with materials that would otherwise require printing and duplication by the instruction. Conferencing has allowed easy access by learners to course related on-line information, such as web-based URLs. Web-based conferencing has also been used by faculty to post surveys to which learners have been able to respond anonymously. This capability has enabled faculty to conduct pre-tests and post-tests to assess learning.

Training Strategies to Support Faculty and Student Use of AltaVista Forums

At the University of Indianapolis, hands-on training sessions have been and continue to be conducted in order to provide faculty with orientations to AltaVista Forums. In addition, a self-paced training/reference manual was developed for faculty and learner use. The manual teaches the user how to obtain an AltaVista Forums account, how to access the account, how to log-in, create a forum, post to a forum, read a post, reply to a post, delete messages, establish links to other webpages, and how to configure a forum to do special tasks such as notify members when a post has been made.

Administrators at the University of Indianapolis have found that the AltaVista Forums software is extremely easy to use, but that the more difficult component is organizing the conference in a manner that makes sense to the learner. Therefore, faculty at the University of Indianapolis are encouraged to lay out the conference on paper in a storyboard fashion prior to creating the conference online, in order to identify the easiest means for the learner to navigate through the conference. One important lesson that has been passed along from University administrators to faculty in training sessions is that conferences should be developed using as few layers (levels of folders/directories) as possible so that learners do not get lost while navigating through the conference.

Student and Faculty Reactions to AltaVista Forums

Student response to the use of AltaVista Forums has for the most part been positive. In a particular case at the University of Indianapolis, web-based conferencing was used in an International Marketing in which learners were required to meet on-line 40 percent of class time rather than spending the time in class. The learners spent the time conducting group work on marketing case studies and were given specific guidelines about how to conduct the case analysis. Their on-line analysis of the case study became their grade for the case study. Several of the learners were unfamiliar with computers prior to the use of web-based conferencing. Learner response was overwhelmingly positive. Some particular responses follow:

- The course makes me think, analyze and summarize data which I collect from the Internet.

- I wish they offered more of this type of learning. I work full time, go to school, and raise 2 children, so my time is very valuable. But I love school so I could come home, and work on the computer, but also learn more than just international business, but also computer skills, typing skills and research all in one, plus more.

- Distance learning is great! It gave me a chance to learn at my own speed and also to interact with foreign students.

The vast majority of the learners found the use of web-based conferencing to be an enjoyable and worthwhile component of the course. Several learners asked the instructor if she planned to use web-based conferencing in more of her classes.

Negative responses which have been received have been minimal, and have typically reflected problems accessing computers or problems using computer hardware and software, which are beyond of the AltaVista Forums program.

The instructor of this particular course reported that, in her estimation, students submitted much higher quality case study reports in terms of the content and thoroughness of their work. Faculty at Indiana University have reported that the integration of AltaVista into courses is beneficial because it provides a focal point for the course other than a classroom, one that students can access 24 hours a day. Additionally, faculty have reported that they find it beneficial to have a shared "group memory" of course materials, as they are added over the semester, and that the use of the Forum encourages greater planning and structure for courses.

Advantages/Disadvantages of AltaVista Forums

Several advantages and disadvantages of using AltaVista Forums have been identified in the preceding section. Overall, the primary advantage is the fact that it facilitates any-time, any-where interaction between course participants. Also, since web-based conferencing is independent of time and location, it seems to foster student interaction; this may be because students are able to interact with the discussion when it is convenient to them, or because students have more time to reflect upon their response they may provide better quality answers than they do in the regular classroom. One point for certain is that quick-witted students are less likely to dominate the discussion, since shy or contemplative students now have an equal opportunity to participate and make valuable contributions.

Disadvantages have also been identified. Primarily, learners must have access to a computer and more importantly, the web—which may be a hefty requirement for some students. Additionally, AltaVista Forums will not work with Windows 3.1, therefore students must use Windows 95 or a Macintosh.

Some faculty have reported that they simply don't like the concept of the conference, and that they prefer to have messages be delivered to them along with all their other e-mail.

Overall, the biggest disadvantage to using Alta Vista Forum from a faculty perspective is the amount of time that must be devoted to reviewing and answering correspondence, which can be an overwhelming task. In larger classes, it may be virtually impossible to review all correspondence. Faculty who have integrated web-based conferencing into their classes have commented how surprised they were at the amount of time it took to keep up with the steady flow of correspondence. Similar to a traditional course offering, the correspondence picks up significantly as deadlines approach.

Web-based conferencing has already been a useful to many faculty who have been encouraged by university administrators to integrate more technology into their teaching. Most faculty who begin to use web-based conferencing in their classes continue to use it in future courses. They may start small and growth with their use of the product, but few, if any, discontinue its use after their first attempt. This fact, more than all the discussions in the current professional literature, indicates that web-based conferencing is here to stay.

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The Role of Live, Online Collaboration in Distance Learning

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The Nature of Learning Faces Change

The rapid adoption of Internet technologies has created a worldwide communication platform that has opened up vast opportunities for overhauling the delivery of education. The World Wide Web's hypertext environment has already made the simple self-paced learning experiences offered by self-education books, video courses, or computer-based training materials almost a commodity. But distributed learning, even though it has already established its value, will achieve its potential only as the technology is enhanced to make it a platform solution for all three of the most important modes of learning experiences—asynchronous collaborative learning, sametime collaborative learning, and self-paced learning.

Types of Online Learning

Asynchronous Collaborative Learning

Asynchronous, collaborative, instructor-led learning, as delivered in the pioneering Lotus LearningSpace product, is much more effective than simple self-paced learning experiences. Asynchronous collaborative learning supports multiple levels of interaction among class members, small groups and teams, and instructors. The learning environment must support tools that facilitate creating and delivering courses: posting lessons, course materials, and exams; grading assignments; monitoring assessments; and providing private and secure feedback to individual students and groups. The environment must facilitate and encourage collaborative communication among class participants at all times via online discussions (both asynchronous and sametime), shared whiteboards, application sharing, and document sharing. All this can take place in an "anytime-anywhere" environment wherever the students and instructor have access to the necessary communications network.

Asynchronous learning is the most flexible form of distributed learning, and instructors and students alike praise the quality of the learning experience it provides. Instructors who have taught LearningSpace courses report that asynchronous learning pushes students to take more responsibility for their learning and to reflect more deeply on the course material. They cannot rely as much on instructors to process the material for them in lectures, and they benefit from being able to tackle ideas at their own pace. One LearningSpace student expressed the difference this way: "In lectures one can absorb the content while remaining a passenger. In LearningSpace you are actually asked to drive the car. You can't simply sit back; every question demands thought and response."

Early users of distributed learning have been adult, part-time learners looking for quality education provided by employers, higher education institutions, training firms or professional associations. These individuals seek high-quality education for personal or professional development. They need alternatives to full-time study and traditional classroom delivery. They are learners who want network access to learning and want a richer learning offer than is available by buying a book or video or simply retrieving Web pages. They want an experience enhanced through interaction with peers and experts through online collaboration and the flexibility of anytime learning.

Sametime Collaborative Learning

Audio- and video-conferencing at the desktop is quickly becoming a practical application as improvements in computing power and high-bandwidth networks spread through corporations and educational institutions. The combination of computer-based video with other computer-support tools, such as electronic whiteboards and the ability to share applications, has been quickly adapted into distributed-learning applications. Lotus is bringing this sametime learning technology into the LearningSpace product family with the code-named LearningSpace "Live," based on the DataBeam Learning Server from DataBeam Corporation (acquired in May 1998 by Lotus Development Corp.), and other Lotus Sametime technology. LearningSpace "Live" supports sametime learning applications that deliver real-time audio and video with support for shared objects—whiteboard, multimedia, private conversations, chat, and other features.

Sametime learning provides synchronous collaboration and event-structured learning experiences. These are distributed counterparts to learning activities that once required sameplace, face-to-face contact—lectures, seminars, demonstrations, classroom discussions, office hours and project team collaborations. Sametime learning requires instructor facilitation tools to control presentations, ask questions of students, "call on" students, and manage the discussion and interaction in the sametime session. It also requires "awareness" of who else is online for *ad hoc* student-to-student, sametime interaction.

Sametime applications are expanding their reach into markets for distributed learning and collaboration once served by audio- and video-conferencing. Sametime courses can be taught simultaneously to multiple remote sites. Special events can be scheduled to present course content and to support asynchronous course materials.

Self-Paced Learning

"Self-paced" describes learning experiences that often mix a variety of media including books, videos, audiotapes, and computer-based training materials. The World Wide Web's hypertext structure and support for multimedia makes Web-based documents obvious replacements for some of these technologies. Delivery of frequently used training materials such as new employee orientations as Web-based content is commonplace, even though development of effective materials is still time-consuming.

Increasingly, self-paced education will be but one component within a complete platform for on-line learning as improved content-development tools and support for industry standards make it easier to integrate quality self-paced learning objects into the online, anytime learning environment.

The Requirements for Distributed Learning Technology

Internet technologies have given distributed learning a jumpstart in its rush for market acceptance. Hypertext, rich text, collaboration tools, real-time audio and video, and streaming media put the tools of teaching on the PC desktop. Before distributed learning can provide the kind of radical changes its supporters envision in the market, today's products must deliver a greater proportion of the full solution than they currently provide.

Take multimedia content as an example: Delivering multimedia content across an intranet to a student's PC can be done today. But delivery technology—Web browsers, plug-in applications, streaming media servers—is just one piece of a much larger puzzle. Delivering multimedia content to thousands of students requires systems support on a very different scale. Managing archives of multimedia objects—putting them into searchable indexes, making them available to instructors, creating libraries of standard objects that can be easily linked into lessons, packaged and sold or even rented on a per-use basis—requires a structure of solutions that adds more robust course-creation applications, administration functions, standards-based formats, and archives.

The technologies used in distributed learning solutions must be turned into complete solutions that address the needs and opportunities facing higher education and corporations.

Flexibility

A distributed learning solution must support all three modes of distributed learning and the media native to each mode in order to provide the course developer and instructor with a full set of instructional and facilitation tools—and be architected in such a way that the product can keep up with the moving target of PC capabilities:

- **Sametime learning**—The traditional methodologies of seminar and lecture aren't made obsolete by distributed learning. They become instructor-led, event-based learning experiences that can be integrated into a course and ad hoc study group sessions that require support for their own media tools, such as shared whiteboards and the ability to share applications across the network.

- **Asynchronous collaborative learning**—Learners need the flexibility to access learning anytime and anywhere on a globally distributed basis. Instructors, experts and colleagues are critical to the learning process and only asynchronous collaborative learning supports the richness and social interaction required for many forms of learning while providing the flexibility of anytime, anywhere access.

- **Self-paced learning**—The integration of self-paced education with asynchronous and sametime education solutions requires tools that save instructors from doing double work to make a course serve the needs of a collaborative group, while also allowing an individual student to profit from self-guided study and review.

Scalability

Scalability will be critical to a distributed learning solution. It must support much more than just taking a course online:

- It must enable the easy development and revision of courses in an environment that lets an instructor integrate materials ranging from a single question to a live lecture to an entire series of lessons.

- It must provide an administration environment that makes it easy to manage all the activities of a virtual campus from managing individual courses (to archive a completed instance of a course, to open a new instance) to managing a catalog of courses, registrations, sametime events, instructor schedules, and student profiles and records.

- It must support access to student profiles and distributed media resources via standards-based formats, methods, and repositories.

Open Solutions

A distributed education solution must provide an open platform so that all the activities of course design, instruction, collaboration, and evaluation can be shared among business partners for complete solutions. The marketplace demands a standards-based platform that will support a value-chain approach to distributed learning:

- Corporations want a decision-to-desktop solution. They want to be able to choose from standard courses, integrate them with proprietary materials, outsource the hosting of courses, contract for instructional services, and interface their existing systems to these sources so that the course is delivered to the desktop quickly and easily.

- Academic institutions and training companies want a manageable, efficient environment for the maintenance and delivery of courses. This would give them access to larger markets for their existing products, and would create new markets for their course-creation and instruction services.

- Service providers will build businesses on hosting courses and providing shared collaboration spaces and libraries of media objects.

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Excerpted from "LearningSpace: Turning Technology into Solutions for Distributed Learning," a White Paper by Lotus Development Corp, Draft June 98. The final version of this White Paper will be published in July 1998.

Autobiographical Sketch

Debra Black is the Market Development Manager for Corporate Training and Distance Learning at DataBeam Corporation. She has worked in the field of communication technology since 1985. Black's work focuses on the impact of communications technology in corporate distance learning and training. She is an active member of the American Society for Training and Development, the Western Cooperative for Telecommunications, and the Masie Center Online Learning Council, and is responsible for designing and implementing her own sales training programs. A graduate of the Duke University Fuqua School of Business, Black also works proactively with educational institutions to promote distance learning in the classroom. Prior to joining DataBeam, Black was a product manager at Exide Electronics.

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The National Guard Distributed Training Technology Project: Training Soldiers and Serving Communities

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Project Vision

To provide the National Guard with high-speed information access to maintain military readiness, strengthen U.S. workforce productivity and skills and improve quality of life in communities where our soldiers live and work.

National Guard Roles and Missions

The National Guard has a unique Federal-State status wherein it fully supports the National Command Authority and the global needs of the Active Army and Air Force. The National Guard is a mainstay of the Nation's ability to conduct and sustain combat operations. In addition to support for active Army and Air Force overseas missions, the National Guard has primary responsibility for the continental defense of the United States. In its Federal role, the National Guard is currently serving around the world, including Operation Joint Venture in Bosnia. The National Guard serves as a State military force when not federalized by the President. In its State role, the National Guard can be mobilized to support civil authorities in response to natural disasters, civil disturbances and other emergency situations.

As the Army and Air Force downsize in response to the end of the cold war, the National Guard will take on new, more sophisticated and more complicated roles. The Army National Guard (ARNG) currently constitutes 55% of the total Army's combat maneuver, 46% of its combat support, and 25% of its combat service support forces. The Air National Guard (ANG) is an integral part of U.S. Air Force operations to include air defense of the continental United States and air refueling operations around the world. While the active Army and Air Force are based primarily at large military installations, the National Guard is geographically dispersed throughout 3300 communities.

Distributed Training Technology Project Mission

The National Guard Distributive Training Technology Project (DTTP) is a state-of-the-art, technology-enabled solution for improving national security and military readiness by increasing access to military training and providing commanders with advanced communications capabilities. Through the DTTP, the National Guard will be able to conduct cost-effective training for soldiers, airmen and units via distributive learning media and methods. Under the concept of "shared usage," it will also assist in economic and community development through public access to some of the best educational resources in the nation. Shared use of DTTP facilities will allow broad community access to high-end learning technologies on a space-available basis at affordable costs. The DTTP will include classrooms in all 50 States, the District of Columbia, Puerto Rico, The Virgin Islands and Guam, making it one of the first truly national distributive learning networks.

Military Training

The National Guard conducts individual skills, self-development, and professional development training as well as organizational training. The training demands due to increased readiness requirements, force structure changes, and the need for increased professional development and educational opportunities can no longer be met by conventional training methods. The National Guard can no longer afford to satisfy its training requirements by sending soldiers to resident training centers. As the Congress has identified, distance learning technologies offer the potential for the Guard to increase its state of readiness while providing support to the Active Army and to the Nation's communities.

Command, Control and Communication

Although training requirements continue to be refined, the network architecture is based on international standards and the principles of open systems, thus allowing it to be flexible and adapted to changing requirements. One of the foremost requirements is supporting simultaneous transmission of voice, data, high quality video, and in the future, high resolution imagery. The Asynchronous Transfer Mode protocol used by the DTTP provides the high-speed telecommunications to support an optimal technology network for the National Guard. In addition to wide-area communications networks, the State Area Command nodes will provide the focus for all communications within the state and between State and Federal authorities. The State Area Command nodes will consolidate current voice, video and legacy data networks to eliminate stovepiping.

Shared Use

To ensure cost effective use of Congressionally appropriated funds, the DTTP network will be made available, when not in use for military training, for community and economic development and improved civilian educational opportunities on a cost-reimbursable basis. Shared use with the community promises to enhance civil-military cooperation; increase local educational opportunities; showcase a test bed for shared use of training technology programs and collaborations; and will ultimately promote economic and educational development nationwide. Shared usage will directly benefit both the National Guard and the community by providing constituencies with easier, more affordable access to the full spectrum of emerging learning opportunities.

Project Milestones

The development, mobilization and management of a cadre of Distance Learning-capable instructors and the development and conversion of appropriate Distance Learning courseware and training materials are means for achieving quantifiable improvements in military training and mission readiness. Milestones for achieving Distance Learning's potential impact on National Guard readiness include:

- **2003**—The power of DL to improve readiness is measurable in terms of accelerated delivery of training and improved soldier performance. DL also improves recruiting and retention by providing increased access to soldier education needs.
- **2010**—A consistently high standard of readiness at all force levels is achieved and maintained by full integration of networks, classrooms, qualified instructors, courseware and training simulators. Accelerated training and realistic organizational training simulations enable rapid response to emerging/evolving missions.
- **2023**—Military occupational specialty training and professional education are provided on-demand, anywhere, any time. Military readiness is accomplished through the latest, most advanced training methodologies, state-of-the-art communications, and information and simulation technologies.

Summary

As this report demonstrates, the National Guard is actively implementing a world-class distance learning network throughout all 54 States and Territories to deliver training to maintain soldier and airman readiness for National Guard missions. By bringing classrooms and instructors to soldiers and airmen, distance learning promises a significant opportunity that the National Guard can use to maintain the required readiness levels. Additionally, this initiative breaks new ground in the cost-effective use of Congressionally appropriated funds. When not in use in support of National Guard missions, the NGB network will be made available for community development and improved civilian educational opportunities on a cost-reimbursable basis.

Autobiographical Sketches

Lieutenant Colonel Craig Bond is assigned as the Distance Learning Team Chief, Army Training Division, National Guard Bureau. He is tasked with improving readiness by implementing training components of the National Guard Distance Learning Program. Prior to this assignment, Lieutenant Colonel Bond served as an Army National Guard liaison at the U.S. Army Training and Doctrine Command. His aviation assignments include assault helicopter pilot in Vietnam; unit trainer, instructor pilot and platoon leader in the Maryland Army National Guard; standardization instructor pilot, Fort Rucker, Alabama; and aviation safety officer at the National Guard Bureau. Lieutenant Colonel Bond holds a bachelor's degree in English Literature and a master's degree in Administration. He is currently completing post-graduate work in distance learning.

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Legal Terminology on the Internet

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Introduction

Laura has a small son, and she participates in Legal Terminology from her home computer very early in the morning before her son arises. Jenny uses her employer's computer to participate in class before and after her workday. Bryan works in Alaska this summer; he did not have to decide whether to take a summer job or continue his education; he does both. Sophie cannot attend class as she is currently serving a sentence in the detention center. Her education continues even though she cannot physically attend classes. John is a full-time student, working many part-time jobs. He participates in our class between jobs, using the computers in our school's Open Computer Lab.

We originally designed Legal Terminology on the Internet to provide flexibility for our students with childcare responsibilities that occasionally prevent their attending classes and their withdrawing from classes. Four challenges motivated us as we designed this course to serve our students:

- Our course would help learners construct meaning for themselves.
- We would incorporate learner support.
- We would bring together a diverse group of learners who rarely, if ever saw each other, into a learning community.
- We would evaluate the course to learn if intended outcomes matched actual outcomes.

Helping Learners Construct Meaning

Legal Terminology on the Internet was designed around the principles of adult learning theory, cognitive and constructivist learning theories, and multiple learning styles. The students were to be active learners, assuming much of the responsibility for their learning, with the teachers serving as a resources, guides, as well as active learners in the construction of the new knowledge to be generated from this course.

We sought to help our learners link course content with their previous knowledge and experiences, with information available from outside resources, and with opportunities to transform all that information into meaningful knowledge. To meet this goal, we designed many features for students. Students have access to the instructor's Lecture Notes that incorporate New Mexico law and expand material from an assigned text. A Hot News feature provides the opportunity for the instructor, webmaster, and students to post messages pointing out legal terms used in current national and local news. The course provides links to legal forms, case law, statutes, and administrative regulations on the

Internet. Lecture Notes, Hot News, and Resources serve as selection strategies, directing student attention to relevant information (Olgren, 1998). The course provides online assignments and quizzes, word searches, crossword puzzles, and a midterm. Quizzes are automatically graded and scores immediately returned to both the instructor and the student. Students have the opportunity to retake the quizzes until they are satisfied with their quiz grades. The online quizzes, midterm, assignments, and questions embedded in the Lecture Notes provide rehearsal strategies (Olgren, 1998). Assignments that ask students to create concept maps or write a fictional newspaper article detailing the pretrial phases of a criminal trial serve as organization strategies (Olgren, 1998). Moderating class discussions, justifying homework answers, and providing support for class discussions serve as elaboration strategies (Olgren, 1998).

Adults learn best from activities placed within a social setting that provides opportunity for learning from each others' experiences, exploration of alternative perspectives, reflection, action, and further reflection (Brookfield, 1986). Accordingly, an important feature of Legal Terminology on the Internet are the weekly class discussions. Students apply the material and concepts covered in the text and lecture notes and read each other's perspectives with as much time as needed to reflect or gather resources before posting at least three messages a week. Students, the instructors, and guest speakers take turns leading the class discussions. Assigned moderators initiate weekly discussion topics, encourage participation, refocus the discussion midweek, and conclude the discussion at the week's end. Five guest speakers moderate discussions for one week each.

Supporting the Learners

While the ability to participate in our class from home, work, and school computer labs provides convenience for our students, it also separates us. Therefore, a crucial component of our class is the communication and support that connects us.

We provided many ways for the students to interact with each other and with us at the students' convenience. The ways we communicate include 1) students' and instructors' individual e-mail accounts, 2) class e-mail address, 3) instructor and webmaster joint e-mail address, 4) phone, 5) fax, 6) snailmail, and 7) office visits.

Feeling integrated into the social and intellectual life of class and feeling a significant personal tie with people in the institution and classroom are crucial factors for staying in a class and school (Tinto, 1993). Therefore, the discussions that take place before and after class are an important part of creating a classroom of learners. In our class, the before-and-after-class chitchat takes place in our Student Lounge. Here students post notices seeking help, post information about interesting verdicts and lawsuits, share movie reviews, post jokes, and send virtual flowers and cards.

Social presence is a strong predictor of satisfaction in a computer conference (Gunawardena & Zittle, 1997). In all our forms of computer-mediated communication with students—e-mail accounts, lecture notes, hot news, the virtual classroom discussions, and the student lounge—the instructor and webmaster strive to ensure their messages convey a positive social presence with its two components—intimacy and immediacy. Emoticons are used to enhance messages.

We hold four orientation sessions over a one-week period and encourage students to attend one of the sessions held in TVI's Open Computer Lab. The orientation sessions provide learners with information about accessing the class, participating in class discussions, and completing assignments. Students have the opportunity to meet other students, the webmaster, and the instructor. We take a digital photograph of each student, which we post with the students' permission.

Another means of supporting our learners is through frequent and individualized feedback with the instructor. Students have a choice about how much interaction they wish to pursue with the instructor on assignments as the instructor continues to probe the students' opinions and understandings with each communication.

Building a Community

Connecting a diverse group of learners through technology neither automatically creates a community of learners nor ensures learners will be tolerant of their differences or cognizant of their commonalities (Gudykunst, 1991). To accomplish their common goals of learning legal terminology while maintaining their current lifestyle, learners need to recognize their common interests and objectives for taking the course. One of our first assignments during our orientation week asks our students to state their objectives for taking a legal terminology course and for learning through the Internet.

Building and maintaining a community of learners also take intentionality (Baker et al., 1998). We designed additional assignments to intentionally develop an environment of social and intellectual belonging. We began the course asking the students to propose ground rules to guide discussions and agreed to the ground rules by consensus. Students, guest speakers, and the instructor share the role of weekly facilitator, moderating discussions, inviting students to participate, and weaving thoughts together into new knowledge. Students pose and answer each other's requests for help.

Evaluation

Is there a discernible correspondence between the intended and actual outcomes for a class that conducts itself in such a way? To answer these question, formative and summative evaluations were conducted. The instructor sent Plus/Delta forms to the students during the course. The instructor and webmaster frequently solicited informal feedback about course content, course features, and procedures during phone calls and through e-mail messages with students. The college's Title III office surveyed the students at the end of the course, and the instructor surveyed the students three months later.

Student comments varied. Most students found the glossary, resource links, and Hot News features useful. All agreed there was a definite connection among the lecture notes, textbook readings, and assignments. All felt the opportunity to e-mail the instructor was helpful and opportunities for interaction with the instructor were plentiful. Half the students felt Legal Terminology on the Internet required more time than a traditional class; half felt the course took less of their time than a face-to-face class. Most agreed they would enroll in another distance learning class and would recommend distance learning courses to other students.

Technical Aspects

Producing a web site of this size and magnitude required a significant amount of planning before actually writing any code! We spent hours discussing how the site would operate before settling on a directory structure. We drew a site map to visualize navigation through the pages. We deliberated if we wanted to control students' paths through the pages much like reading a book or if we wanted to allow them to choose their own paths. We settled on a primarily linear design, but incorporated other designs as appropriate. In general, students seemed to prefer the linear design, as it was more similar to reading a book. This may also be due to the fact that some students were novices at using the Internet.

We looked at various ways to allow interaction in the course and attempted to use all the methods that seemed appropriate. Using email lists would allow easy access for all to send messages to the group, and having mail in the mailbox would be a motivation to respond. Using the web discussions, we would see the thread of the discussion and could easily refer to the previous comment. We decided that both types of communication would be important for this course. With both of these methods being asynchronous, we searched for a way to provide synchronous communication. Since there was no facility in place on our server for a typical chatroom, we took the "wait and see" approach. We found that students who had instant-messaging capability enjoyed using it. But asynchronous methods were the foundation for the communication.

To use any of the web features beyond basic web pages, we needed to run CGI (Common Gateway Interface) scripts on our server. This required us to learn how to understand and modify PERL scripts, and set permissions on our UNIX server. We found scripts that were available on the Internet to use and modify, and obtained the help of our local network administrator for specific installation instructions. Setting up the password protection was a similar process, requiring help for our specific server. Although a significant amount of time was spent on these aspects of the site, we felt that privacy was required for the students to feel comfortable discussing sensitive topics, so password protection was a must.

Graphics and clip art were needed to reduce the strain of having a lot of text. We used primarily commercial clip art, in accordance with license agreements. Using a repeating graphic and different colored sidebar for each section gave a color theme for each "chapter." Each page generally had four different navigation buttons. Students could move forward or backward in the lecture notes, move directly to the chapter menu, or back to the main menu. By keeping these similar throughout the site, the navigation scheme was consistent and predictable.

Utilizing "guest speakers" on the web seemed a strange concept until we realized that they would lead the discussion in the Virtual Classroom. The biggest challenge was orienting those speakers who were novices to the Internet. We needed to ensure that they had proper connection to the Internet and were prepared to interact within our structure.

Overall, a significant amount of time was required to prepare the web site. Subsequent semesters require only minor adjustments to some of the files and monitoring of the links to other sites which might have changed or become invalid. Content changes may be made at any time, at the discretion of the instructor.

Addresses for CR240, Previous and Current Classes

http://w3.tvi.cc.nm.us/cr/lt/su97	Pilot semester
http://w3.tvi.cc.nm.us/cr/lt/s98	Second semester
http://w3.tvi.cc.nm.us/cr/lt/su98	Current course in progress . . . please do not participate in the discussions.

username: cr240
password : 32nm64

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Dynamic Evaluation of Distance Education Courses

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Abstract

The feedback systems currently used by many instructors are much like autopsies. Once the class is over, they attempt to discern what went wrong. This post-hoc process will become increasingly unacceptable as universities and corporations compete for the education of the global market. One solution is an innovative evaluation system, developed by Psychology students and faculty at Rensselaer, which provides a high quality of service to students in distance education, interactive learning, and studio-based courses. The Interactive and Distance Education Assessment Laboratory (IDEAL) was designed to provide quick-time feedback to instructors, allowing them to adjust their delivery during the class period. This technology provides the feel of a small classroom-type environment to students, even those physically located across the globe. It may also be used, in conjunction with an evaluation team, as a way to reduce the time-consuming chores of test construction and grading, allowing more time for teaching and assisting student learning.

Introduction

In a small classroom, an instructor can adjust the content, pace, and emphasis of course material depending on the feedback provided by the students through verbal and non-verbal cues. A puzzled look or a pause in note taking may prompt an instructor to restate a point or to give an illustrative example. In a large classroom, even the best instructors have difficulty determining whether some or all of the students are "getting it" during the course of a lecture, demonstration, or discussion. In a distance education-based course, the ability to receive on-going feedback from students during the delivery of material ranges from extraordinarily difficult to nearly impossible, depending on the media that is used. However, an innovative evaluation technique is nearing its completion, whereby instructors can receive feedback and offer a small classroom-type environment to students who are physically situated across the globe. This technology can be illustrated in the following scenario in which an instructor teaches a course via satellite to 200 students across five continents:

> Following a brief lecture, the instructor directs students to a website containing a brief quiz or "concept check"; 15 items are constructed to measure comprehension of key concepts and 5 items assess attitudinal measures, such as the perceived relevancy, difficulty, and efficiency of the lecture. The students point-and-click through the questionnaire and submit their responses.
>
> Within seconds, all 200 responses are immediately collected, sorted into folders based on classroom location and student, dropped into a spreadsheet, analyzed by a macro, and the results are printed and electronically delivered to the instructor. Within minutes, the instructor has descriptive statistics for each item and can determine which topics need further clarification, and can estimate the current level of student satisfaction with the discussion. For example, perhaps the majority of

> students in North America scored well on comprehension, but students in the Korea site did not (indicating a possible cultural difference that the instructor may resolve by using terms less unfamiliar to the Asian students). Perhaps a majority of students across all sites scored low on a particular test item, indicating that the topic represented by that item needs further clarification. The System Administrator, who has discussed the evaluation items with the instructor apriori, may provide nearly any descriptive or inferential statistic, classification, or categorization the instructor may desire. For example, the instructor may wish to know if students with the highest scores on a particular topic are also those tending to be strong in a particular learning style and whether this holds true across both American and European students.

The technology underlying this evaluation technique has existed for some time. Indeed, the means by which education is delivered has not been constrained by technology or human creativity. It has, however, been constrained by psychological and social limitations. The important question is not *can we teach* using interactive or distance learning technologies, but rather *how can we maximize* student learning through their use. Our research team has found that the incorporation of *learning styles* as a measure of individual differences among students, has been useful in explaining student performance in the distance education classroom, as well as in interactive learning studios and collaborative classrooms. Our solution, therefore, was to construct an assessment system which incorporated learning styles, teaching styles, and other measures of individual difference into the evaluation of interactive and distance learning. This system, called *IDEA* (Interactive and Distance Education Assessment) is described herein.

Learning Styles

The evaluation of distance education has often focused on comparisons between traditional and distance formats and on the characteristics of "effective" students and instructors of each format. In brief, researchers have found that distance education instruction is perceived to be less clearly presented, results in higher test scores of achievement, forces instructors to become better organized and prepared, and requires extensive formative evaluation to be effective (Souder, 1993). Distance-learning students appear to be more successful, in part, because they tend to be older, more motivated and self-disciplined, are more likely to possess a college degree, and have expectations for higher grades (Gottschalk, 1996).

What is often missing from the research on distance education is the inclusion of learning styles as a variable of interest. The concept of *learning styles*, that students have a preferred way of using their intellectual abilities (Sternberg & Grigorenko, 1997) has a long history in Psychology. Research suggests that students whose learning styles are compatible with the style of teaching delivered in the classroom, may perform higher than students whose learning styles are not compatible with such an instructional style (Furnham, 1992; Honey & Mumford, 1986; Ingham, 1991). Every successful instructor realizes that not all students learn best using the same method. Some students prefer a hands-on approach in which they can see and feel the material in order to best understand; some prefer to work with teammates; others gain knowledge by just reading the text themselves; and still others find that real-life examples or stories from their instructors are most informative. The key, therefore, is to identify which students favor which particular methods in the form of their learning style. Failure to account for this individual psychological difference may explain the ambiguous evaluation results that often result.

Our previous research (Champagne, Goldberg, Glinert, Breimer, Lim, Moyer, & Tunney, 1998) included the following five individual difference measures:

- **Self-efficacy,** or the confidence one has in being able to succeed at a particular task, has been shown to lead to greater persistence on a task (Bandura, 1982), which can be demonstrated to result in higher performance.

- **Positive affect** (PA) reflects the extent to which one feels enthusiastic, active, and alert. High energy, full concentration, and pleasurable engagement describe an individual with high PA, while sadness and lethargy describe one with low PA. **Negative affect** (NA) is a general dimension of subjective distress and unpleasurable engagement that subsumes a variety of aversive mood states, including guilt, disgust, anger, contempt, nervousness, and fear. Therefore, one low in NA would be described as calm and serene.

- **Locus of Control** (Rotter, 1966) measures an individual's expectancy for control of reinforcement. Individuals with an internal locus of control believe that events are due to personal, stable, relatively permanent characteristics, whereas individuals with an external locus of control believe that events or consequences are under the control of someone else, and are not dependent on their own actions.

- **The Learning Style Inventory** (LSI: Kolb, 1976) is a 12-item instrument designed to assess how individuals learn and how they deal with day-to-day situations. The responses indicate each student's emphasis on four learning modes: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE). In the CE stage of the learning cycle, an individual tends to depend more on his or her feelings, rather than a systematic approach to problems and situations. In the RO stage of learning, individuals use patience, objectivity, and careful judgement before contemplating action. The AC stage of learning involves logic and analysis, rather than feelings, to understand problems and situations. In the AE stage of learning, individuals experiment with ways to influence or change situations and are concerned with what really works (Kolb, 1976).

- **The Work Preference Inventory** (WPI: Amabile, 1987) is a 30-item instrument designed to assess the intrinsic and extrinsic motivational orientations of college students and working adults toward their work (the college student version was used). Although primary scales of the WPI are intrinsic and extrinsic motivation, these scales are broken down into secondary scales. These include enjoyment, challenge, outward, and compensation. Enjoyment and challenge are representative of extrinsic motivation and outward and compensation are representative of extrinsic motivation.

After two semesters of evaluating several undergraduate courses (e.g., Physics I, Computer Science I, Graph Theory), the LSI and self-efficacy measures were demonstrated to be the most useful of the five original measures. For example, in the Physics I course, the correlations between two measures of self-efficacy and final grades were higher ($r = .42$ and $r = .38$) than were the correlations between final grades and an existing measure of knowledge of Physics concepts ($r = .22$). In the Graph Theory course, students who scored higher on the Reflective Observation (RO) learning mode of the LSI, also tended to do well on three of the four individual homework assignments ($r = .69, p < .05; r = .60, p < .10; r = .63, p < .06$). Their RO scores were not correlated with any of the team projects for the students. This is encouraging since the RO learning mode is characteristic of tendencies to use one's own thoughts and feelings to form opinions and to use patience and careful judgement before contemplating action. Although such tendencies may be appropriate for individual work, they may not be appropriate for teamwork to be completed in a short period.

The Technology

In order for students in a distance education course to be able to "point-and-click" their way through the learning styles measures and receive quick-time feedback as described in the scenario above, the measures had to be posted to a website. This was completed and pilot tested by students taking the Physics I course on campus. However, in order to be flexible, the evaluation system had to be able to accommodate organizations that have no access or restricted access to the Internet. For this reason, Intranet versions of the same measures were created in LotusNotes®. The two versions differ only in terms of how the measures are received. Students access the website in the Internet version, but students are sent the measures via e-mail in the Intranet version. In both cases, students read the instructions, point-and-click through their responses, and then hit the "submit" button to send their responses back to the IDEA laboratory for immediate analyses.

Two advantages of this system are the small classroom "feel" provided, and the assurance of reliable and valid measures. The instructor can obtain as much information from her students across the globe as that obtained in a traditional classroom. The feedback provides the instructor with the opportunity to adjust her teaching style to accommodate individual differences in learning style, as well as resolve common misunderstandings that may stem from differences in language and culture. In terms of reliability and validity, the evaluation team provides the validation of the comprehension items to assure the instructor that the questions accurately measure what they purport to measure and are consistent across students, between classes, and over time.

The following pilot study incorporated the successful learning style measures with the technology developed to deliver evaluation instruments. Since the organization sponsoring the distance education course had limited access to the Internet, the LotusNotes® version was used. The course is still in progress, but some preliminary results are offered here.

Preliminary Study

Participants

166 employees of an international company participated in the distance education course. They were located in Australia, Brazil, Canada, England, Finland, France, Germany, Korea, Mexico, Netherlands, Sweden, and the United States. The U.S. employees were located in Alabama, Massachusetts, New York, South Carolina, and Wisconsin. Attendees in the course ranged widely in age, experience, and job titles, although the majority were middle to upper level managers. Participation in the course was voluntary.

Procedure

The course was entitled "Financial Wellness" and consisted of a combination of Accounting and Managerial Finance topics. Seven two-hour lectures were delivered live via PictureTel® from a New York site over a two-month period. A financial expert (in the form of an upper-level financial manager) was present at each site to offer support and to clarify minor points during the lecture or after class.

The instructor began each class by "taking role," whereby each of the 20 sites would check in to ensure there were no technical difficulties. Each site answered by pressing "mute off" on their remote control, allowing the instructor to hear the reply. Each site was muted unless participants had questions to ask of the instructor. Students from each site could view both the instructor and a still shot of the white-board that presented relevant financial and accounting formulae. Lectures were frequently punctuated with questions from the sites, which were answered by the instructor as they arose.

Following the first lecture, the participants were sent a satisfaction survey (see Table 1) via LotusNotes® technology. This survey consisted of 23 items intended to measure student attitudes towards the course material, the delivery of the material, the instructor, and the "fit" of the course with their career goals. The measure was similar to the course evaluation used by students in courses at Rensselaer, but revised to accompany items requested by the organization and the instructor.

Since all participants were familiar with using electronic mail, the survey was delivered in the form of an e-mail message to be completed and returned. The results of individual items on the survey were delivered to the instructor prior to the next lecture session in order to adjust course content and delivery. In addition, the students were encouraged to send individual comments to the evaluators about any aspect of the course.

Following the third lecture, the participants were sent the *Learning Styles Inventory* (LSI: Kolb, 1976) via the same technology. This data has been collected, but cannot be meaningfully reported until the final performance measure is given (see below).

Measures Yet to Be Administered

The participants will be sent the same satisfaction survey following the fifth and seventh lectures. At the conclusion of the course, the instructor will hand out a final examination to be completed individually. This performance measure will assess comprehension on the topics discussed throughout the course.

Preliminary Results and Discussion

Sixty percent of the participants responded to the first satisfaction survey, and the results were highly positive. For example, 89% of participants agreed that the course was well organized, 73% agreed that their understanding of the financial concepts improved after the first session, and 85% agreed that the examples and illustrations were effective. Overall, the average of the majority of the items was significantly higher than those reported from traditional course evaluations.

Of more interest, from a problem-solving point of view, are the more negative results. For example, item #12 (see Table 1) stated, "The technology used to deliver this course is hampering my ability to learn." Those participants who agreed with this statement also tended to find the topics less interesting ($r = -.46$), felt less motivated ($r = -.36$), found less fit of class to career goals ($r = -.48$), had less interest in the subject ($r = -.47$), and rated the instructor ($r = -.48$) and class ($r = -.55$) lower overall (all *ps* significant at .01 alpha level). In addition, eight participants disagreed with the statement, "This course fits well into my overall career goals." It will be interesting to note if both sets of individuals will have a higher dropout rate than those participants who did not feel that the technology was hampering their ability to learn or who felt that the course fit their career goals.

Table 1. Satisfaction Survey Administered to Distance Education Students

1. The course is well organized.
2. The course material is being covered too quickly.
3. My understanding of accounting and finance has improved as a result of the first session.
4. I see that this course will bring measurable value to my job
5. The instructor presents the subject matter clearly and effectively.
6. The instructor stimulates my interest in the subject.
7. The instructor encourages questions and student participation.
8. The instructor is well prepared and uses class time well.
9. The instructor uses effective examples and illustrations to clarify concepts.
10. The instructor has excellent command of the topics.
11. The language differences are hampering my ability to learn.
12. The technology used to deliver this course is hampering my ability to learn.
13. I was knowledgeable about the course topics prior to taking this course.
14. I am confident that I will do well in this course.
15. This course fits well into my overall career goals.
16. I prefer the distance-learning format rather than having an instructor present in the room.
17. I find the topics in this course to be interesting.
18. I am motivated to do well in this course.
19. Frequent breaks with local discussion would be helpful to the learning process.
20. I see the relevance of this course to my current job.
21. Overall, I would rate this instructor as . . .
22. Overall, I would rate this class as . . .

Note. Statements 1 through 20 use the following response scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral (choose this response if you can't decide whether you agree or disagree, or if statement is not applicable); 4 = Agree; 5 = Strongly Agree. Statements 21 and 22 use the following response scale: 1 = Poor; 2 = Average; 3 = Good; 4 = Excellent.

Interestingly, only 3% of respondents preferred the distance-learning format rather than having an instructor present in the room. The impact of this attitude towards the technology has yet to be examined. There was also a large range of responses to the statement, "I was knowledgeable about the course topics prior to taking this course." These responses will be correlated with the performance measure and final satisfaction measures to determine the role of experience with attitudinal and ability outcomes.

Advantages of This System

Although the focus of this pilot test has been on the flexibility and variety of feedback provided by this technique and the role of learning styles, there are many other uses for the IDEA system:

Separation of testing and teaching. A common complaint of instructors is the amount of time spent constructing and administering exams. Use of the IDEA system will significantly reduce time spent by instructors and their teaching assistants in producing and correcting exams. Apriori discussions between the evaluation team and the instructors about the course content and structure, the instructor's objectives, and his or her preferred teaching style, will provide the basis for erecting an evaluation system that is comprehensive in scope but efficient to implement and maintain. This efficiency will shift the burden of testing and grading to the evaluators, allowing the instructor to spend more time teaching and assisting students.

Synchronous classrooms. Although the pilot study described here was for asynchronous learning, the system is designed to provide evaluation for synchronous distance learning as described in the earlier scenario. Regardless of the manner in which the course and feedback is delivered, the content of the evaluation would be the same.

The role of information technology in education. The research and education communities have had great success in developing technology-based educational delivery formats (e.g., interactive, satellite, and Web-based learning). However, similar progress has not been made in understanding how these technological delivery formats interact with psychological and social characteristics of the learners (e.g., learning styles, cognitive needs, and preferences in learning environments). The strength of the IDEA laboratory is in merging information technology with psychology to address the concerns of the emerging global university.

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Autobiographical Sketch

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A Case Study:
Increase Enrollment by Reducing Dropout Rates in Adult Distance Education

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Adult Education

The U.S. Department of Education defines adult education as the teaching of adults via any education activities, except full-time enrollment in higher education credential programs. According to the Digest Education Statistics published by the U.S. Department of Education (1997), the number of adult education participants among 117,826,000 employed persons during 1996–1997 was 59,734,000.

What motivates adults to be involved in continuous formal education? Houle (1971) conducted a qualitative study from which he identified three types of adult learners: goal-oriented participants, activity-oriented participants, and learning-oriented participants (cited in McCreary, 1990). Verduin & Clark (1991) categorized three main types of adult education programs: adult basic education (ABE) programs (to acquire ABE), leisure and enrichment education programs (to increase enrichment in adult life), and career education programs (to prepare or upgrade their job-related knowledge and skills). Examples of adult education activities include part-time college attendance, classes or seminars given by employers, classes taken for adult literacy purposes, adult basic education or English as a second language, or courses for recreation and enjoyment.

Adult Distance Education

Distance education is defined as "any formal approach to learning in which a majority of the instruction occurs while educator and learner are at a distance from one another" (Verduin & Clark, 1991, p. 8). Distance education, due to its time and geographic flexibility, has appealed to working adult learners who work full-time yet want to seek for continuous education. Many adult learners attempt to achieve their goal of adult learning via distance learning options. Distance education institutions use various distant learning technologies such as audio and video conferencing devices, the Internet, or computer-mediated communication systems. According to a survey conducted by National Center for Education Statistics in 1995, out of about 14.3 million students enrolled in higher education institutions in fall 1994, about 758,640 adult students formally enrolled in distance education courses in academic year 1994–95. Eighty one percent of institutions reported that they offered courses designed for undergraduate students; thirty four percent for graduated students; and thirteen percent for professional continuing education. Among the distance education institutions, thirty nine percent of them targeted professionals who were seeking recertification, and 49 percent targeted other workers who looked for skill-updating or retraining as potential audiences.

Adult Distance Education in Boise State University

The Instructional and Performance Technology (IPT) Department at Boise State University offers a Master's degree program via distance education (DE). The IPT-DE program is intended to prepare adult students at distance for careers in the areas of instructional design, job performance improvement, human resources, organizational redesign, training, and training management. The majority of students attend the IPT's distance program not only to earn a master's degree in IPT but also to upgrade their professional knowledge and skills. In this paper, we will discuss what problem we encountered, how we approached a solution to the problem, and what results we obtained.

Problem: Some New Adult Distance Students Do Not Continue

When new adult distance students come to a distance learning environment, they encounter an unexpected problem. New adult distance learners who are used to the traditional classroom learning environment often feel overwhelmed by the new way of learning and fail to adjust themselves in the new environment. Chacon-Duque (1987) conducted a survey study and concluded that learners' perceived course difficulty, motivational levels, and persistence levels were good predictors of students dropouts from Pennsylvania State University's Independent Learning courses.

The IPT-distance program at Boise State University found out that distance students who stopped registering after their first or second distance courses usually did not come back to complete the distance program (Fenner, 1998, unpublished manuscript). In contrast, completion of as few as three courses was found to be a strong predictor of students who would more likely complete their master's degree program.

Cause Analysis: Why Did They Drop Out?

In order to find out the causes of dropouts, the distance education coordinator conducted interviews with the students who dropped out of the program as well as those who were continuing the program between 1989 and 1996. From the interviews, it was concluded that satisfaction during the first or second courses was the major factor that determined their decisions to continue or not to continue to learn. Forty two percent of the students who dropped out of the program expressed "dissatisfaction with the learning environment" as the reason for their dropping. Another reason that they dropped out of the program was due to a discrepancy between their professional or personal interests and the course structure.

The student interviews revealed more detailed information about the root causes of their dissatisfaction with the learning environment. During the first or second course, they were overwhelmed by advanced knowledge and overloaded information. They perceived themselves as learners with low confidence levels. They were concerned whether they had an appropriate manner for online interaction with other students as well as with the instructor. They worried if they were able to use the communication software as a learning tool effectively. They expressed a concern of whether their written messages were good enough. Some students perceived the distance learning environment as a de-personalized environment. They wondered if their messages were really read by others. Some students expressed difficulty in communicating online. They wanted to have more structured feedback from the instructor and dynamic interactions with other participants.

Intervention: How Did We Approach a Solution to the Problem?

From the cause analysis, it was obvious that a solution to the dropout problem was to help new distance students be satisfied with their performance during the first or second course. In the spring semester of 1997, the IPT-DE program started focusing on implementing new interventions in instruction, especially addressing how to increase new distance students' confidence and satisfaction levels. The instructor who taught the introductory course used Keller's ARCS model to systematically redesign the curriculum. The Organizational Elements Model (OEM) was used to guide designing the changed inputs and processes to produce desirable products in terms of students' improved performance and desired outputs in terms of the increased number of enrollment due to the reduced number of dropouts.

Inputs and processes. The instructor developed strategies to improve students' attention toward learning, to make the learning more relevant to their professions, to help increase their confidence levels, and to increase their satisfaction of both the learning subject and the learning environment. Following are several instructional objectives and strategies that the instructor used to guide her instruction:

- To guide new distance students in learning how to use the learning tools effectively
- To make the distance learning environment personalized and safe
- To give learners clear expectations in terms of learning processes and outcomes
- To design and deliver instruction based on ISD principles
- To learn about individual learners as much as possible
- To monitor individual learners' performance
- To help learners self-monitor their own performance
- To provide individual learners with immediate, frequent, and regular feedback
- To coach them to increase new knowledge in the IPT field
- To encourage high interactivity among participants
- To help them develop self-regulated learning behaviors

Among the instructional strategies, the use of a criterion-referenced pre-test and post-test as well as the use of a self-confidence level assessment were critical. At the beginning of the semester, a pre-knowledge assessment was administered to measure students' current knowledge levels in the field of IPT. In the assessment, the confidence levels toward their own knowledge were measured as well. With the data obtained from the assessment, the instructor was not only able to design instruction with appropriately set objectives but also able to plan to provide more adaptive instruction to individual learners at a distance. Students who showed low readiness levels in both cognitive and affective domains were provided more structured guidance. Students who had high levels of cognitive and affective readiness were provided more challenging tasks in order to prevent boredom.

Products. Since the spring of 1997, the changes in students' performances were systematically evaluated. In every semester, significantly positive results were achieved. Not only the new distance students' achievement scores were significantly changed but also their confidence levels were significantly different. In the spring semester of 1997, the pretest results and the posttest results were significantly different, $t\ (11) = -20.61$, $p < .01$. The average score on the pretest was 24.58 and the average score on the posttest was 36.83. In the summer semester of 1997, the average score on the pretest was 25.59, and the average score on the posttest was 34.78. The difference between them was significant, $t\ (16) = -7.64$, $p < .01$. In the fall semester of 1997, the average score on the pretest was 25.38, and the average score on the posttest was 34.81. The difference between them was significant, $t\ (15) = -9.25$, $p < .01$. The self-confidence level test was administered with the posttest. It was found that the correlation between their self-confidence levels and performance levels was significant at the .05 level, $r = .52$.

During the spring semester of 1998, the new distance students' entry knowledge levels and confidence levels were measured in both the pretest and posttest. The average score on the pretest was 24.71, and the average score on the posttest was 36.43. The difference was again significant, $t\ (13) = -13.04$, $p < .01$. The average pre-confidence level was 56.79 and the average post-confidence level was 134.86. The difference was significant, $t\ (13) = -13.17$, $p < .01$.

Outputs. Between the fall semester of 1989 and the fall semester of 1996, 44% of distance students dropped out of the program by their third course. A year after the new interventions were implemented, the dropout percentage was reduced to 22% (Fenner, 1998). That means that we achieved a significant improvement in our retention of students by using effective instructional interventions. Among the 22% who dropped out of the program, three students dropped out after the first week of the course due to hardware and software incompatibility problems. Six students cited that they decided not to continue the program because their professional goals and the degree program did not match. One student cited a health problem. Another student cited time constraints.

Outcomes. According to Kaufman and Thiagarajan (1987), the final result of instructional intervention in the results chain is its social impact. In our case, various positive social impacts of our organization's success can be predicted. Successful instruction delivered via distance learning program by our organization will help more adult learners be able to pursue their continuing education than before. Our society will have more professional instructional and performance technologists. Such professionals' improved performance will in turn have positive impacts on various parts of our society such as industry, business, education, and military.

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Using Web-Conferencing With Primarily Interactive Television Courses

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Introduction

IITV at NAU

Northern Arizona University has a long tradition of delivering courses at multiple sites across the state. While NAU promotes itself as the best residential student experience in the state, NAU also has the mission of providing 3rd and 4th year higher education to the rural areas across the state. For many years, this was accomplished by "circuit rider" faculty and part-time faculty who lived close to the various sites. Over the past seven years, NAUnet, headquartered in Flagstaff, has been implemented using federal and state dollars. NAUnet is a professional-broadcast-quality, two-way audio, two-way video instructional television system. It has been set up with a control room at each site, so any site on the system can both originate and receive courses. The system features two digital circuits between the south of the state and Flagstaff; the balance of the circuits are analog, carried on a microwave system with sufficient bandwidth to carry audio, video and data signals.

At the front and rear of each television classroom is a 60 inch viewing screen. At the heart of the video system is a nano-splitter that divides this viewing screen at each site into nine panes. Each of those nine panes can be divided into four so that there can potentially be up to 36 sites interacting with each other across the state. The students talk to each other over voice-activated microphones on each student desk. The site operator can bring up to full screen the speaker at any site so that, for a few moments, that person has the stage. Courses are broadcast live to the various television classrooms across the state and are also broadcast over local cable television systems.

The IITV system provides a face-to-face environment where students and faculty can see and hear each other and engage in discussion. Most of the usual social context cues (for example, age, gender, ethnicity, educational level and socio-economic status) are evident or can be deduced so are available to aid in the communication and community-building process. Time, however, is limited to 55 or 70 minute periods, which limits the time available for each student to give input into the discussions. Typically, the faculty person lectures, with the occasional question to the students. A limited number of the more verbal students often provide the majority of student input. Learning by observation and listening may occur, but many students do not have the opportunity to express their opinions or ideas to their peers or to the faculty person.

Recently several courses delivered via this network have acquired a web-based conferencing enhancement so that discussion continues in the NAU Online Virtual Conference Center among students and faculty between the broadcast classes. A total of forty-three classroom courses were similarly enhanced during Spring semester, 1998.

The NAU Virtual Conference Center is powered by Caucus Software. This web-based, asynchronous, conferencing system was chosen, in part, because it is accessible via any web-browser, through any venue that provides access to the browser: local and national commercial internet service providers, college labs and wired dorm rooms; from work, home, public libraries or public computer labs on campus. Many students and faculty have experience using a web-browser when they start the course, so accessing the web-based conferencing system is a relatively small step forward.

One humanities professor has made particularly good use of the integration of synchronous television with asynchronous computer conferencing and it is his courses from which the following observations are drawn. This particular professor teaches to as many as 16 sites across the state and has as many as 150 students in each of two classes taught each semester.

Teaching Methodology

The teaching methodology has changed very little in the transition from live television to live television with web-enhancement. The instructor has developed a series of twelve, cumulative written assignments that the students must complete; one assignment a week during the semester. The first assignment is to explain the teaching/learning model used for the course. The 2nd assignment is to "dump out" what is known about the topic of the course, or the topic chosen by the student. This sets a baseline against which future elaboration can be gauged. Each assignment elaborates on the preceding one to illustrate the acquisition of the perspective addressed in subsequent steps in the learning model. These assignments follow an "escalator format" whether the course is focused on a single topic, or the students apply the steps to their own choice of topics.

Prior to the implementation of the web-based conferencing system, students kept their weekly written assignments in a folder and turned them all in at the end of the semester with their final project. Some students wrote an assignment a week; some students put off the writing until the last week or two of the semester. The teaching methodology always required collaborative work: typically students exchanged their written assignments with others at their own site, offering critique of each other work, also in writing. The course work culminated with a final project in which students could demonstrate, in their choice of media, what they had learned.

Students started the course with an A grade and maintained that A by showing increasingly sophisticated levels of elaboration, analysis and integration in their written work and appropriate application of the steps of the learning model. This was problematic for students who are used to regular graded assignments and tests as they received little or no feedback on their written work from the faculty member during the semester. While students at the individual sites got to know one another and sometimes to talk before and after class, students across sites were rarely able to socialize with each other or pursue any collaborative learning efforts.

The faculty member was able to get to know only those students who typically spoke up in class. He was also faced with an enormous amount of reading at the end of the semester when assignments and final projects were turned in.

Introducing Web-Based Threaded Conferencing "Conversational Spaces"

At the beginning of Fall semester, 1997 a web-browser-accessible "virtual conference center" was introduced to NAU using software that created conferences for individual classes, and used "items" as conversational spaces within the course conferences. Students continue to attend two televised classes per week.

In these humanities courses each student created their own virtual conversational spaces in which to put their weekly writing assignments rather than writing them out on paper. Other students could then read these assignments and comment on them. Students soon discovered the fastest way to attract other students who could offer information and critique was to read and comment on other students' work, thus creating some reciprocal social obligations.

Gains

The addition of this online venue for class discussion has had several remarkable results. Students from across the state can now interact together online, building on their accustomed interactions in the television classroom. The television course provides an ongoing personal context—for the most part, students can eventually put names, faces and voices together when they read the online conference contributions. Students who take the course over the campus cable system can also participate with their peers in a way that has been impossible in the past. This has led to greater identification with the class group and increased participation on the part of these erstwhile invisible class members.

The conversational time possible for these courses has expanded far beyond the two 70-minute class periods that are televised each week. Students are entering assignments and commentary into the course conference day and night throughout the week. Many students spend 8 or more hours a week on task, which time is recorded by the conferencing system, as is the items that they read besides their own.

Students are welcoming each other to the conference center, critiquing each other's work, offering each other suggestions, finding and sharing resources. Reading each other's work allows students to bring multiple perspectives to bear on their own work and often "unblocks" students when they reach an impasse in their own thinking.

The faculty member quickly found that he did not have to comment on each student's work—the other students were doing that for him. While he does read all new input at least four times a day, directs student work with strategically placed questions and comments as they work their own way through the steps of the learning model he has provided for them. Points raised in the television classroom are commented and elaborated upon in the web-based computer conference. The faculty person also remarks during the televised portion of the course on what he has read from the students in the web-based computer conference.

The time in which discussion can take place has expanded to 24 hours a day, 7 days a week (given a student has this kind of access to a networked computer). This has made it possible for all students to contribute to the discussions, without feeling pressured by the limited time available in the televised portion of the course, or by fears commonly experienced in front of a camera. Students can now take the time to reflect and consider their input, revise and edit their contributions until they are comfortable "publishing" them to their peers. Students can now engage in multiple conversations with multiple course members and read, study and critique each other's assignments, often offering insightful suggestions and valuable resources.

The ethnic population of Arizona is as varied as its topography. Flagstaff in the north is at 7000 feet, Yuma in the south at less than 2000 feet. The northern non-white population is heavily Native American, whereas the southern non-white population tends to be more Hispanic. There are two large urban centers in the state (Phoenix and Tucson) and vast expanses of rural reservation where many homes have neither electricity or running water.

Languages typically spoken among the course members includes English, Navajo, Hopi, Apache and Spanish. Non-native speakers of English are not hampered by lack of facility in spoken English when making written comments in the web-based conferencing center. Nor are differentially abled students penalized—working in the virtual conference center a partially sighted student and one confined to a wheelchair with cerebral palsy who had a severe speech impediment found themselves, for the first time, on a equal footing with their peers.

Each student has their own particular point of view and opinions influenced by their ethnicity, culture, life experience, age, gender etc. These different points of view can now be shared with other class members as each topic is discussed from these multiple perspectives.

The faculty member has found the reading load is now spread over the entire semester. The evolution of the student's learning is now accessible to his inspection as he reads their weekly assignments and listens to their classroom comments. He can have greater input into each student's learning experience as he is able to comment continually on their online assignments and written comments to other students.

Continuing Concerns

Most of the students are able to gain access to computers running a web-browser at regular intervals, but some still can not. Only one of the television classrooms is still without networked computers, and those will be installed during this summer. Those students without internet access have been encouraged to fulfil all the course assignments on paper. During the televised classes some students who were without Internet access have expressed a sense of dislocation and of missing out on the sense of community developed by those who were working together in the virtual conference center.

Some students flourish under the learning regime used in these courses. While they report working harder than in most other courses, they also appear to experience greater personal growth and acquire transferable intellectual tools that they can use in other courses. Other students are continually frustrated by what they perceive to be the lack of faculty-imposed structure and the divergence from teaching models with which they are familiar. They are at a loss to gauge their own progress towards the A they are seeking, when their progress is not constantly validated by quizzes, tests and graded assignments.

Student Reaction

During the first class meeting of the second semester students were introduced to the combination of technologies used in the course. To assuage the anxieties of students new to the combination, students who had taken a similar course the preceding semester were asked to express their opinions. The following comment, transcribed from the video-tape of that meeting, was made by an adult student at one of the state-wide locations. She is a nurse, who works at nights and is a single parent, working on her bachelor's degree. Her words summarize comments made by a number of other students who also added their opinions:

> On the first day last semester when I was introduced to this new way of doing things I wanted to quit, right then. It was hard enough making it to a site for the television class without having to use a computer, too. But I didn't have much option. I had to have a humanities class and there wasn't anything else that fit my schedule. By the end of the first week, I was feeling a little more comfortable; by the end of a month I was really enjoying myself; by the end of the semester I wished I could take all my courses like this.

Autobiographical Sketches

Mauri Collins is Research Associate and Adjunct Assistant Professor in The Institute for Learning and Technology at Northern Arizona University. **Zane Berge** is director of the Training Systems graduate program at UMBC. Both are widely published in the field of computer-mediated communication used for teaching and learning. Most notable are seven books they have co-authored: *Computer-mediated Communication and the Online Classroom* (Volumes 1–3) (1995) and a more recent four volume series, *Wired Together: Computer Mediated Communication in the K12 Classroom* (1998). Berge Collins Associates also consults and conducts research internationally in distance education.

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Beyond Black Boxes, Bells, and Whistles: Community Development Through Distance Learning on Montana's Indian Reservations

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The University of Great Falls has been providing complete undergraduate degrees via technology to rural Montana since 1978. Currently, there are 29 fixed site locations in the university's distance learning network. Five of these sites are in Alberta, seven in Wyoming, and 17 in Montana. Five of the Montana sites are affiliated with Tribal Colleges on the Blackfoot, Rocky Boy, Fort Belknap, Crow, and Northern Cheyenne Reservations. Through a comprehensive transfer agreement with these Tribal Colleges, Native American Students can complete any of 13 undergraduate degrees without the costs and disruptions of relocation.

Until the 1998 Fall semester, the university's delivery strategy utilized faculty produced video tapes in the university's production studios and a dial-up audio-only interactive session that allowed multipoint conferencing via dedicated land lines or 800 dial up access. Beginning with the 1998 fall semester, a 15-seat LearnLinc test bed will be established that will move the system onto the World Wide Web. Completion of this transition is scheduled for January 1999.

The university offers over 150 courses per year in support of the 23 undergraduate degrees. A number of graduate courses are also available, but at this time not graduate degree can be earned via distance learning.

The establishment of a Partnership in Education program with Montana's Tribal Colleges has paved the way for the application of educational experiences in community development within reservation communities. The degrees that offered through this Partnership are:

- Business Administration
  - Management
  - Marketing
  - Financial Services
  - Health Care Administration
- Computer Science
- Computer Systems Integration
- Chemical Dependency Counseling
- Counseling Psychology
- Criminal Justice
- Elementary Education
- Human Services
- Paralegal Studies
- Theology and Religion
- Sociology

These degrees directly address the economic and political challenges of the late 20th century. The most perplexing and challenging issue on reservations today revolve around issues of sovereignty. These issues range from economic development to criminal justice administration, from Tribal education needs to chemical dependency. By providing baccalaureate degree programs via distance learning technology, a student at the Tribal College is able to access all the academic and cultural support networks that the Tribal College has established. Through financial aid eligibility and distance learning scholarships, native American students are able to complete their degree without large loans in many cases. Tribal Higher Education groups often match Pell grants, and with dual enrollments and university scholarships, students have manageable costs each semester.

The two most recent initiatives are in financial services and elementary education. Few reservation communities have tribally chartered banks or credit unions. Only Blackfeet National Bank is self-chartered by the Tribal Council. The remaining reservations must rely on non-community based banking institutions. In partnership with the BNB and Blackfeet Community College, a degree in financial services is being developed. This degree, which will be provided to all reservation sites, will develop a cohort of reservation citizens that will be able to full exploit the financial services opportunities that reservation communities need. In cooperation with the First Interstate Bank and the Northwest Area Foundation, a grant is being sought to establish this program with significant student support and mentoring services. Further cooperation with the Tribal Business Information Centers (TBICs) will assist qualified graduates in securing SBA loans and other financial opportunities.

The degree in elementary education leading to state certification will provide a cohort of reservation stakeholders that will address the turnover rate in reservation schools.

The University of Great Falls has long passed the point of argument and debate over what technology, what degrees, and what courses should be offered in a comprehensive distance learning program. The university utilizes an increasingly cost effective technology that challenges both faculty and students. The move to a cyberclassroom will significantly enhance application sharing and bring the power of the World Wide Web into faculty development activities.

We at the University of Great Falls accept the challenge of moving beyond the Black Boxes, Bells, and Whistles of technology that so challenge and limit distance learning. We are seeking to apply the technological and educational resources to provide opportunities for personal and community development throughout our distance learning network.

Autobiographical Sketch

Dr. Colby Currier earned his BA from the University of Maine, his MA from the University of Arizona, and his Ph.D. from Washington State University. He taught for many years at Olivet College in Olivet, Michigan, where he chaired the Science Division. In 1994, Dr. Currier accepted the position of Dean of Distance Learning at the University of Great Falls. Since 1994, Dr. Currier has created a Partnership in Education with some 20 community and tribal colleges in Montana, Alberta, and Wyoming. This Partnership allows site bound students to complete one of thirteen baccalaureate degrees through dual enrollment between the host school and the University of Great Falls. Utilizing an asynchronous delivery strategy based on faculty produced videotapes and a multipoint conferencing system; the distance learning program at the University of Great Falls has served over 13,000 students since 1978. Dr. Currier is married to Dr. Susan Gray and resides in Great Falls when not on the road throughout the university's network.

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A Method for Teaching Integrated Product Team Concepts to Remote Students

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Introduction

The graduate program in Engineering Management in the College of Engineering and Applied Science at the University of Colorado at Boulder offers a Master in Engineering (M.E.) for working, professional engineers preparing for early management positions. The program is offered to traditional, on-campus students and to remote students through the Colorado Advanced Training in Engineering and Computer Science (CATECS) program. CATECS provides the studio-classrooms, broadcasts live televised courses to a number of company sites located along the Colorado Front Range, and produces videotapes for those students outside the broadcast area. The live television broadcasts are one-way video and two-way audio.

Each year, approximately 50 students are admitted to the program, and at any one time, approximately 130 students are active in the program. Students are required to have at least two years of professional work experience to be admitted to the program. About 90% of the students are at remote sites throughout the United States and around the world. There are some sites where several active students are clustered, but there are also many students who are isolated at a particular site.

Motivation for Teaching Integrated Product Team Concepts

Very large or complex development projects in industry often require that individual components of the project deliverable be developed separately and later integrated (Meredith and Mantel, 1995). Individual teams of engineers work on the development of the components and then integrate their contributions into a final product deliverable leading to the concept of an integrated product team. While individual components have sometimes been developed at different physical sites, this capability has recently been greatly facilitated by the incredible advances in communication technology ("Networks That Do New Tricks," 1998). Since many of the students in our graduate program are engineers working on development projects and programs, it is valuable to provide them with the experience of working on an integrated product team. Many of the companies where these students work have begun to strongly emphasize the use of globally dispersed teams for this purpose. As Knoll and Jarvenpaa (1995) suggest, global collaboration is becoming more the norm rather than the exception.

Integrated Product Team Methodology

The experience of an Integrated Product Team was added to the introductory course in the program: Introduction to Engineering Management, which is required of all students. Other types of team projects have been used in this course in the past. The way these teams were formed and how they functioned have been described previously (Daughton, 1996).

Course Format

The format of this particular course lends itself quite nicely to an integrated product team experience. The course structure is built around the seven categories of the Malcolm Baldrige National Quality Award (National Institute of Standards and Technology, 1998). While there is no intent to teach the mechanics of application for this award, the seven categories provide a framework of management dimensions appropriate for such a course. The seven Baldrige categories are Leadership, Strategic Planning, Customer and Market Focus, Information and Analysis, Human Resource Focus, Process Management, and Business Results. The structure and format of the award criteria provide an excellent source of insight into the various aspects of these management dimensions. As a complement to the course, an application of these criteria to a fictitious company as a class project provides a more in depth understanding of the management dimensions imbedded in the Baldrige award structure. The assessment of a fictitious company application for the Baldrige Award by class teams forms the basis for the integrated project team experience.

Project Structure

The class was divided into eight integrated product teams whose challenge was to develop a final product, which in this case was a single, comprehensive assessment of the application of a fictitious company for the Baldrige Award. A fictitious company application was obtained as part of a case study packet for groups or individuals seeking to learn more about Baldrige assessment techniques (American Society for Quality, 1998). Each case study packet contains an application of a fictitious company for the Baldrige award and a scorebook. The scorebook has assessment sheets for each of the components of the seven categories and a summary assessment worksheet so that the case study application can be fully assessed and scored against the Baldrige criteria. The eight teams of students were formed to work on the assessment against the criteria in each of the seven categories and to develop the summary assessment. Each of the seven category teams worked exclusively on their assigned category and then worked with the eighth team to develop an integrated company assessment. This was particularly challenging since the criteria in each category have some overlapping and complementary features with the other categories resulting in a need for collaboration between the teams to ensure a consistent, integrated assessment. The class project extended through the entire semester providing plenty of time for team formation and the completion of the assessment.

Team Composition

The students were allowed to divide themselves among the eight teams primarily based on individual interests in the different Baldrige categories. Every team was required to have at least one member that was not co-located with other team members to provide experience in distance teaming. To facilitate organizing the teams, all the students were required to subscribe to an Internet class list that provided asynchronous email communication through posting of messages to all subscribed list members. There were typically 5–8 students on each of the teams.

Lessons Learned

Feedback was solicited from students at three points during the semester. Students were sent a short questionnaire via the Internet class list as the teams were being formed, while the assessments were being done, and when the project was completed. The information from these questionnaires along with the evaluation of the final, comprehensive assessment provided a basis for analyzing the value of this learning experience.

All of the responding students indicated that they had no major difficulty in finding a Baldrige category team that matched their interest. Only 11% of the respondents rated the Internet class list as ineffective in helping find a team. By this was meant that the large majority of students felt this vehicle enabled remote students to identify other students with similar interests in certain Baldrige categories and organize a team based on that interest. In fact, the teams were entirely organized by the students themselves with no intervention by the instructor. Several remote students did comment that connecting with other students would have been less traumatic if pictures or biographies of all students would have been available at the beginning of the semester.

During the course of the semester, responding students indicated that the vast majority of interaction among team members was via email. The same was true for interaction between the various teams. Most respondents felt that poor email skills and habits were the major barrier to effective inter-team and intra-team communication. Many expressed a desire to have more face-to-face interactions through videoconference technology. As would be expected, most of the inter-team communication was between the seven category teams and the summary team providing inputs to the summary team or seeking clarification on issues such as format, deadlines, and content integration.

At the end of the semester, 88% of the responding students felt that this project gave them a very good to excellent appreciation of how a company can be assessed using the Baldrige criteria. All respondents indicated a good to very good appreciation of how an integrated product team works. The survey results show that 87% of the students indicated little to no trouble working together with other members of their team, and 62% indicated little to average trouble in coordinating inputs with other teams. Finally, 78% of the respondents felt that this project was a useful complement to the course.

In comparing the submitted final integrated assessment against the scoring key provided with the case study packet, the instructor found very good correlation. The overall assessment score submitted with the class project assessment fell within the solution assessment range given in the scoring key. The comments and observations developed by the students in each of the categories portrayed a consistent picture of the strengths and weaknesses of the fictitious company and were in good agreement with the scoring key.

Summary

This class exercise demonstrates the viability of simulating integrated product team projects using teams of remote students working on a single class project. With the emergence of integrated product teams, many of them globally distributed, it is important that graduate students in technical management gain some experience in this area. The issues and problems reported by students in this exercise are similar to those that many managers in globally dispersed companies now face in organizing and running these teams. The logistics of organizing the individual teams is somewhat cumbersome with students widely distributed and not knowing each other very well when the semester begins. It is recommended that some effort be made to create a vehicle for student introductions such as an Internet class list. From the comments provided during the semester, one clear barrier to success is the degree of discipline students exercise in handling and responding to emails. With this being a primary form of communication, providing some email guidelines for students to follow would be prudent. Overall, it can be said that remote students can effectively collaborate on team projects even one as sophisticated as an integrated product team exercise.

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Autobiographical Sketch

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Distance Learning Audio: Improvements and Developments

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As distance learning is growing in popularity, so is the realization that the audio has not been keeping up with technology. Many people seem to accept that if audio is "audible" it is good enough. But audio is crucial to any form of communication. It is an underlying, often unperceived component of overall quality—even visual image. It has been proven that better audio makes the same video passage look better, although most people can not tell you why! That's the power of highly intelligible audio with clarity and presence.

Poor audio can cause listener fatigue in your distance learning classroom. In order for students to learn at a distance the audio must be clear and intelligible. In a classroom, if the video is distorted or breaks up, a student can tune that out and focus on the audio. Conversely, if the audio is broken up the entire learning process is disrupted. Ultimately, the students will benefit by having a better audio conferencing system.

Audio Problems and Solutions

Room Acoustics

What are some of the causes of poor audio? First is room acoustics. Often classrooms are made up of high ceilings and hard surfaces. This causes the audio to bounce around and create an echo within the room. Audio bounces around and becomes difficult to hear because you hear the original voice plus all the little echoes of the voice. As audio fills the room our ears are intelligent enough to determine from where the audio is originating and focus in on this. Microphones are not picky like our ears; they pick up all audio and send it to the distant site. It is difficult for them to differentiate between the original voice and the echoed voice. This is where problems of intelligibility come into play. While the audio is loud enough it is not clear enough to be understood because the original audio and echoed audio is being sent. The lack of intelligibility makes the voice sound hollow, as if you are talking in a tin can. Fluorescent lights, heating and air conditioners all affect the acoustics of the room. If microphones are placed too close to lights or HVAC systems they pick up the noise from these systems. The noise may be louder than the students in the room speaking. We can't change the laws of physics so it is important to change what we can to improve the audio in the classroom. Things like carpet, curtains, wall hangings or acoustic tiles will improve the audio within a classroom. By "softening" up the room with these materials the audio will be absorbed rather than reflected around the room. It will improve the clarity of the audio not only for the distant classrooms but also for the students within the classroom.

Microphone Placement

Microphone placement is another factor of poor audio. The closer they are to the person speaking the better the audio will sound. All too often a limited number of microphones are installed to cover an entire classroom. Hanging two microphones at the front of the classroom will not effectively cover all the students. The microphone pickup pattern needs to be taken into consideration when installing the microphones in the classroom. If an instructor needs to be free to move around the front of the classroom a lavaliere microphone is a good choice. The tight pickup pattern will focus on the instructor's voice and be less likely to pick up background noise. Podium microphones are a good choice when the instructor will primarily be stationary because of the tight pick up pattern and lack of wires. One of the best choices for students is an uni-directional tabletop microphone. Students will normally talk towards the instructor or the monitor so the microphones should be placed in such a way as to pick up this audio. Ideally tabletop microphones will be strategically placed so that one microphone covers 2–3 students. The goal is for students to interact naturally with all sites and not be intimidated by the technology. While ceiling microphones are often used in classrooms they do not effectively pick up the students speaking because of their distance from the students. The choice of microphone manufacturer or quality will also affect the audio quality. Less expensive microphones may not have the audio quality and clarity desired. They also may not hold up in a classroom environment. Many times with microphones you pay for what you get.

Integration

In order for an audio system to function, it must integrate many different pieces of equipment each manufactured by a different company. This can be difficult to match levels and set up the system so that everything works well together. For example, automatic microphone mixers do not work well with echo cancellers. The way the mixers gate microphones on and off distort the "audio picture" the echo canceller has of the room. As different microphones gate on the echo canceller cannot keep up with the changes and the originating site will hear echo.

What Is Echo Cancellation?

The job of echo cancellers is to prevent the distant site from hearing an echo of themselves. When the distant site speaks their audio comes out of the loudspeaker and is picked up by the microphones. The echo canceller samples the audio coming out of the loudspeaker and digitally cancels it when the microphone picks it up. All systems prior to Gentner's Distributed Echo Cancellation™ utilize one echo canceller per room, regardless of the number of microphones being used. This can work in many applications but any time level adjustments are made or microphones are moved the echo canceller would lose its "picture" of the room and would need to be retrained. Room acoustics and the choice of microphone mixers could also distort the echo canceller.

Audio Technology Improvements

Consider the next generation of audio conferencing processor. It is here to answer many of the needs, interests and problems of the distance learning educator. After years of research with integrators, consultants and end users, Gentner Communications has developed a product that jets the audio technology light years ahead. The Audio Perfect product line was designed to address problems in today's audio systems. Problems like the echo canceller not working with the microphone mixer, problems with acoustically reverberant rooms and problems with installing multiple pieces of equipment in to one system. The AP800 combines four boxes into one: a 12 X 12 matrix mixer, an 8 channel automatic microphone mixer, audio processor and most importantly Distributed Echo Cancellation™.

Distributed Echo Cancellation™ (DEC) is a new technology unique to Gentner Communications. DEC™ means that instead of one echo canceller looking at all the microphones in the room there is a dedicated echo canceller on every microphone input. The improved processing power of the AP800 means that the system will adapt much faster to changes in the room, you can even use a roaming microphone and the echo canceller will keep up! Because it processes the information so effectively there is no need to "train" the room by doing the echo cancellation set up. Old echo cancellers would adapt to the room by sending white noise into the room. The AP800 is truly plug and play for the end user—just turn it on and it's ready to go.

One of the first things the AP800 does is to cancel echo. Once the echo has been removed you have a much greater range of what you can do with the system. Level adjustments can be made on any input or output. Audio processing such as automatic gain control and equalization, aspects that previously deteriorated the audio quality of a teleconferencing system, can now be used with the system without affecting the echo canceller.

The AP800's microphone mixer is programmable to fit any application. It has eight microphone inputs but you may link eight units together for a total of 64 microphones—functioning as if it was a single unit. The microphone mixer will help make the audio more intelligible by controlling which microphones are gating on and making certain that only the microphone closest to the person speaking gates on. This will give you clearer, more intelligible audio. The adaptive ambient mode prevents background noise from gating on microphones and sending excess noise to the distant site.

The AP800 is also a 12 X 12 matrix mixer (4 line inputs plus 8 mic inputs). Any input or combination of inputs can go to any output. This adds a level of flexibility that has been difficult to achieve in other teleconferencing systems.

Overall the AP800 adapts to the room faster, handles large and acoustically reverberant rooms better and there is no white noise training required. It is truly a plug and play echo cancellation system.

Are you ready to make a sound investment in your distance learning classroom? Remember, in a classroom you don't just look at what's written on the board, you listen to the explanation of what's been written on the board. The audio in your classroom is critical to effective learning. Gentner, through our advanced technology and consulting services, can help make your classroom an effective distance learning environment.

Autobiographical Sketches

LeeAnn Doane is the National Sales Manager for Gentner Communications Room Systems division. Ms. Doane began her career with Gentner in July of 1993 and earned her Bachelor of Science Degree in Business Management from the University of Utah in June 1997. During her five year tenure at Gentner, Ms. Doane has worked extensively with the Assistive Listening Systems and Teleconferencing product lines. Prior to her affiliation with Gentner, Ms. Doane gained over 10 years of direct sales experience. As well as her dynamic sales abilities, Ms. Doane performs a wide range of training seminars including AP800 Technical Training, Basics in Audio Conferencing (Infocomm), and Advanced Audio/Videoconferencing (MVP). Ms. Doane is an active member of ICIA and MiCTA.

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Creating Service Policies for Computer Conferencing

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In the Beginning . . .

We had no policies for computer conferencing. University of Wisconsin-Madison piloted computer conferencing during the Spring, 1995 semester. The pilot was collaboratively offered by two groups of our Division of Information Technology (DoIT). The Learning Technology Department worked with faculty on how best to incorporate the computer conferencing technology into their curriculum. The Personal Communication Technology Group supported the system and users, and acted as a liaison between DoIT and the vendor. We used the FirstClass software by SoftArc, Inc., chosen for its ease of use, graphical interface, cross-platform capability, and TCP/IP accessibility. Four faculty members and about 200 students participated in the pilot. Because it was a pilot, we allowed any interested parties to view the conferences and content.

We began to offer computer conferencing as a service to the campus for the Fall, 1995 semester. As service provider, and in anticipation of faculty interest, our End User Computing Group developed our first set of policies to address such questions as who is eligible to use the service, DoIT's responsibilities, the customer's responsibilities, and fees. The customer's responsibilities were developed in conjunction with our Registrar's Office, who is considered the owner of campus student data.

Below are listed some important points from the various guidelines:

- **Who is eligible:** Conference owner must be a UW-Madison faculty or staff member, including affiliated UW-Madison individuals, (e.g., System Administration, UW-Extension).

- **DoIT's responsibilities:**
  - Consult with conference owner on how to best set up their conference.
  - Set up accounts.
  - Provide conference owner with participant packets that include: information on where to obtain software and how to install it; usage guide; where to call for help; list of customer responsibilities; policy governing use of networks at UW-Madison.

- **Customer responsibilities:**
  - Conference must fall within the UW-Madison mission.
  - Learn how the software works.
  - Advise students that any information posted to their class conference is public and shared information for education purposes.
  - Hand-out participant packets.

- **Network usage policy:**
  - The networks are to be used primarily for purposes of fulfilling the university's mission of teaching, research and public service.
  - No user may allow anyone else to use their account.
  - All UW-Madison network users must comply with the university's network usage policy.

- **Fees:**
  - $50 per semester per timetable class.
  - $50 per semester plus $20 per participant for any non-timetable conference.

Some points to keep in mind: At this time, the pilot conferences were still open for viewing, based on our policy that "any information posted to their class conference is public and shared information for education purposes." A person who initiates a conference has been labelled conference owner. Although some funding of the service does come from a student tuition tax for technology, we decided to charge a nominal fee to help cover administrative and system costs. Since the student tax is for technology services for students, we decided to charge more for anybody that was using the system for a non-timetable conference, e.g., a continuing education discussion for professionals.

During the Fall, 1995 semester, a student participant in the pilot brought to our attention that their conference contributions should be private to their class, and not available for open viewing. This triggered the re-thinking of our service policies, especially for the conference owner responsibilities. One issue we grappled with is what should be publicly available for education purposes. Based on the fact that e-mail copyright belongs to the author, and that in a "live" classroom, only attendees are privy to the discussion, we decided to make all conferences accessible only to the participants of that conference. The following are some important points from the next policy draft:

> *Faculty Responsibilities as a Conference Owner Regarding the Use of FirstClass Conferencing*
>
> 1a. The faculty will advise students that the class conference is PRIVATE, accessible to only the conference owner(s) and student participants registered for the class. The FirstClass system administrator will have access for administrative purposes only.
>
> 1b. Prior permission from the conference owner must be obtained before anyone not affiliated with the class can participate in or be an observer of the conference. The conference owner must inform students of any non-affiliated individuals granted access to the class conference.
>
> 1c. Prior permission (via signed paper forms or electronic forms) must be obtained from the conference owner and student participants before anyone can conduct educational research on the electronic class conference (i.e., conference structure, conference content, conferencing as a learning tool).
>
> 1d. The faculty should be aware that electronic conversation is different than verbal conversation because it retains the identity of the student participant. It is imperative that student privacy be maintained if conference information is shared.

These policies greatly protected the privacy of the student and their submissions, even for the purpose of information sharing. We also included some standard guidelines regarding the conducting of research. Note that we are still referring to Faculty Responsibilities and Conference Owner.

In August 1996, we made a slight revision to the Faculty Responsibilities, adding:
The faculty will be responsible for obtaining permission to use any copyrighted material posted in the conference. They should also remind participants that they need permission to use any copyrighted material posted in the conference.

The Evolution Continues . . .

As of 1996, our policies were not only printed for faculty distribution, but were also posted in our FirstClass Help conference and on our FirstClass web site (www.wisc.edu/firstclass/). Although our revisions were small for the 1996/1997 school year, our thoughts were churning. Conference owners wanted to retain their conferences in whole, including class materials and student contributions. A new issue was: Who actually owned the conference content? After attending a workshop on Intellectual Property and Copyright, and since we had developed our policies without any legal guidance, we decided to pay a visit to the University's Legal Services. Our goal was to improve the wording of the policies, and to bring to their attention issues regarding conference ownership, intellectual property and copyright, records retention, network usage, research, non-UW-Madison participants. In addressing these issues, legal advisors first look to the paper world for answers. We determined that the conference leader does not own the whole conference and its content. The conference leader does own the conference structure and any of their contributions, such as their syllabus, and their messages. Conference participants own their contributions, including any assignment submissions. If any conference leader or conference participant wants to use any content of the conference that is not their own for educational or research purposes, they need to obtain permission from the conference participants. Note that we are now referring to the conference leader, rather than conference owner. We also changed the wording to more strongly put the burden of conference responsibilities onto the conference leader's shoulders. Our current policies now state:

1a. The conference leader will advise participants that the conference is PRIVATE, accessible to only the conference leader(s) and participants. The FirstClass system administrator will have access for administrative purposes only.

1b. The conference leader must inform participants of any non-affiliated individuals granted access to the conference. Before anyone not affiliated with the conference can participate in or be an observer of the conference, he or she must obtain prior permission from the conference leader.

1c. Before anyone conducts educational research on the electronic conference (i.e., conference structure, conference content, conferencing as a learning tool), he or she must obtain prior written permission (via signed paper forms or electronic forms) from the conference leader and participants.

1d. The conference leader is advised that electronic conversation is different from verbal conversation because it retains the identity of the participant. It is imperative that privacy be maintained if conference information is shared. Participants must agree in advance that conference information can be shared for educational purposes.

1e. The conference leader will be responsible for obtaining permission to use any copyrighted material he or she may post in the conference. The conference leader will remind participants that they need permission to use any copyrighted material the participants may post in the conference.

We've Got Policies, but . . .

We still have several open issues. After attending an E-Mail Management Workshop that also included records retention, we started wondering how records management and retention policy applied to conferencing. This line of thinking led us to meet with the University's Records Management Officer. We are now in the process of developing guidelines in the area of Records and Information Management Issues. One of the first questions we are asking is: What is the definition of a record, and does any conferencing content fall under this definition? We have also divided records and information management issues into the following categories:

- **Access to personal data, including security/privacy:** Federal and state law forbids disclosure of student record information without the student's written consent. Personal identifiable data is also protected. The issue is how best to inform conference leaders that student data is confidential, and to make sure that programs used address this issue.

- **Appropriate use:** This involves two concepts: Identifying the right technology tools to support a specified need; limiting the use of technology tools to those purposes that support the mission of the University. Conference leaders, system administrators, technologists and instructional designers need to be made aware that the least possible amount of student information should be collected to meet a legitimate institutional purpose, and that any program used must follow this principle.

- **Authentication:** Authentication addresses the questions of, "how do I know what I really have," and "how do I know what I have received electronically is coming from the person they say they are?" This area relates closely to security, access and privacy issues. In multi-user workstation scenarios (i.e. computer labs), it is very important to be able to authenticate per work session, per person.

- **Retention and disposition:** Once it is determined which content of computer conferencing is considered public record, it must then be decided which existing retention and disposition policies apply, or if additional policies need to be developed.

- **Preservation:** What information needs to be kept for archival purposes?

Other issues that are on a more global level are: How best to accommodate leaders and participants from other institutions; whose policies are they obligated to follow, i.e., their home institution, or those of the institution sponsoring the conference; what recourse do you take if policies are not observed.

We're Still Evolving

As we have implied throughout this talk, developing policies is a matter of constant revising and tweaking, and working with many experts and references. Several steps are involved: Defining the issue; researching the issue; talking with experts in the appropriate fields;

creating the policies; implementing the programs and procedures that follow the guidelines; and publicizing the guidelines. As we move towards web-based learning systems, ownership of on-line courses is a big issue. We are very interested in learning what are your policies for computer conferencing and computer-based course delivery, how these policies evolved. Feel free to contact us at conf-policy@doit.wisc.edu with your input or questions.

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Autobiographical Sketches

Hildy Feen has over fifteen years of broad, hands-on experience in the personal computer industry. As a technologist for the Division of Information Technology of the UW-Madison campus, Hildy has been working with groupware, including computer-mediated conferencing as a learning tool. Besides researching and evaluating various course delivery tools, most recently web-based tools, she has been the technologist for a FirstClass system at UW-Madison. She has also participated in classes and discussions via computer conferencing, including using FirstClass, Nicenet, Allaire Forums, listserves.

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Judy Brickner has been providing user software support and customer service support for the past fifteen years. As a member of the department of End User computing for the Division of Information Technology on the UW-Madison campus, Judy serves as the project leader for mass communication initiatives. She not only administers the computer conferencing system, but is also the listserver manager, coordinates mass emailings to faculty/staff/student audiences, and provides email directory support.

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Teaching in Control

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Basic Assumptions

- Effective teaching is to assist an active learner. The teacher must engage the student at multiple levels: motivation, information gathering, organization, visualization, analysis, meaningful application/use; although included, effective teaching is not simply the presentation of facts or logic.

- Learning is the measure of effective teaching.

- The ability to teach is the measure of learning. We refer to this process as testing, where the roles of the teacher and student temporally reverse.

These basic assumptions apply to all teaching, regardless of the delivery mode and/or technology used. The integration of technology and interactive video (one-way or two-way) distance education have produced special opportunities for effective teaching. However, to exploit these opportunities, careful design and use criteria need to be established for the development and use of teaching materials and facilities.

Design Principles

Planning, Preparation and Organization of Teaching Materials

Teaching on camera is very different than teaching in a classroom. Generally, the presentation is limited by the amount of information that can be effectively presented on the video monitors. The use of computer generated graphics and text, usually maximizes the effective information density on a video monitor. However, because video monitors have much lower resolution then computer monitors, the following principles should be employed.

- Voluminous material must be carefully abstracted into an outline type format and then converted into relatively small well-designed video bytes.

- Good design requires good video readability which include the following considerations:
    - Background and text color combinations should emphasizes brightness contrast rather than color contrast.
    - Fonts should not be cluttered with shadows or small appendages (Geneva is good).
    - Fonts sizes should be 44 pt or larger.
    - Edge clearances of at least 7.5% of the screen width on each side, top and bottom.
    - Colors that "bleed" on video monitors (e.g. Red) should be avoided.
    - Background patters which can slow the rate of information recognition should be avoided.

- Evaluation of video readability requires the use of a video monitor rather than a computer monitor. The able to read material on a video monitor when concentrating on the screen is not a sufficient test. The material must be easily and quickly readable. When a student is taking notes and/or completing an interactive study guide (Cyrs, 1997), they are frequently required to shift concentration between the video monitor and the note taking activity. A student should be able to read the screen with quick glances instead of requiring unnecessary time to discern words, letters or numbers which run together because they are too small or have insufficient definition with respect to the background.

- The thread(s) of continuity that connects the video bytes are (in order of importance):
  - The interactive student study guide (Cyrs, 1997)
  - The class presentation/discussion/interaction
  - The text

- Good teaching is a learning activity for both the student and the instructor. Dynamic instructors acquire new insights and new ideas for presentations with almost every class. Therefore:

- Continuous updating of presentation materials, including the interactive student study guide, is essential.

- Teachers should master presentation software so that changes and improvements can be made in a timely fashion. We are all subject to sudden inspiration. The ability to make a quick edit to correct an error or to enhance a presentation is highly desirable.

- Do not plan a demonstration or experiment that you have not personally done successfully several times in the distance education environment. If there is no strong reason for the demonstration/experiment to be live on TV, consider a prerecorded video tape. Video tape provides the opportunity to rerun the demonstration or experiment in slow motion or even frame by frame to enhance the discussion.

- Video is a visual technology.
  - Change the image on the monitor frequently (when appropriate).
  - Use a variety of image types (text, graphs, charts, pictures, video tape, student(s), models, etc.).
  - Use supporting images and/or demonstrations of the concepts being presented: animation and/or slow motion; real-time movies/videos (with copyright permission); create and use out-of-studio activities video tapes (informational field trip); pre-video-taped demonstration (experiments, hazardous activity, etc.).
  - Use geometric shapes as structures to illustrate concepts with multiple parts (Cyrs, 1997).

- Technology fails! Have a backup plan for any part of a live presentation which cannot be omitted.

Presentation

- Body language/eye contact
  - Look directly into the camera lens frequently.
  - Be yourself, Be expressive, Use gestures.
  - Use interesting and/or entertaining props but practice ahead of time.
  - Use good posture (front lighting may be inadequate if head and/or shoulders are tilted downward).

- Pace the presentation to allow student response and/or to use the interactive study guide.

- Promote student interaction.
  - Open class with ice breaker activity or story.
  - Create an environment of positive support for responses.
  - Invite/require response from individuals in the studio and at the remote sites.
  - Show enthusiasm for the material being presented and its significance.

Teacher Support

MCC has developed a policy that no instructor is permitted to teach on television without formal training in the use of television teaching methods. Initially the distance education unit at the University of Missouri at Kansas City (UMKC) was used. Subsequently, for several years, a consultant was hired to train faculty. Currently, we have developed our own training program using MCC and UMKC staff.

Major points in a training should include:

- Introduction to the technology (this provides the faculty with a vision of what is possible)

- Demonstrations of good teaching techniques and method of promoting student interaction

- Techniques to develop an interactive study guide

- Characteristics of quality video bytes (examples good and bad)

- The use of colors, clothing selection and props

- Hands on use of chromakey with computer, document presenter, video tape and cameras

- Preparation and presentation a short video class segment (critique focus on positive factors)

Following the training most instructors are enthusiastic about their possibilities. However, success of the training is mixed. Most faculty (and administrators) do not appreciate the level of work and time that is required to do a good job.

In an ideal world, an instructor developing a video class would be released from teaching responsibility for a full semester. Also, an interested person(s) would be available to collaborate, review, and encourage the faculty during the development the course. In the real world, an instructor is give a few hours of overload and works alone. This approach generally will not produce anything other than a talking head presentation.

During early stages of development, instructors are encouraged to schedule time in the teacher controlled classroom to try out and critically review their initial work. Technical support people are made available to assist. Also, instructors are asked to practice in the classroom before the initial class.

Class Signature Video Tape (a one minute class opening) should be prepared for each class. Such tapes prepare the students as a call to class and can also be used to set the mood for a class. A signature video should be recorded on video tape of sufficient length that the instructor is not required to turn it off during class presentation. The tape should have black video and silent audio recorded on it entire length before recording the Class Signature at the beginning of the tape.

A large face digital clock synchronized with the broadcast facility is very useful for starting and ending classes on time.

Audio can be a major problem in any production. The areas of concern include:

- Instructor audio (type of microphone, position/location, instructor posture/ movements, speaking rate)
- Student audio from broadcast facility (type of microphone, activation, position/ location, student generated -noise, background noise, feedback)
- Remote students audio (type of microphone, activation, position/location, student generated noise, background noise, feedback, interface to broadcast signal)

Control of Student Focus

- Video monitors can be used to focus and limit material in a timely sequential fashion.
- Video bytes should be organized into a hierarchic which supports the main concept(s). When possible enter and leave each level of the hierarchic through the same video byte. This will assist the student to place the information contained in a group of video bytes into system of related information. An example of this technique would be an artist who starts with an overview, temporally focuses on a small detail and then return to the overview before addressing the next detail.
- The interactive study guide should contain large scale graphics which assist the student to visualize the video byte hierarchic and integrate the video bytes into a coherent presentation.
- The use of chromakey permits the presenter to enter and leave the field of focus without breaking visual contact with background information. This tends to maintain continuity in the presentation.

Clearly, a well planned presentation is not a trivial activity. Careful thought, organization, anticipation of student questions and time is required. It is not easy, but it is very rewarding in professional satisfaction.

Teaching Station

A teaching station has only one function—to assist a teacher to teach. A teacher controlled distance education teaching station is no different. The design of such a station should incorporate usable technology with teacher friendly interfaces and should provide the following attributes:

- The appearance of simplicity by minimizing the teacher operated controls. Technical anxiety is proportional to the number of visible knobs, switches, meters and lights. The essential teacher operated controls are a) image selection, b) camera(s) operation, c) remote site audio response (e.g., telephone or telephone bridge) and d) VCR.
- Simple monitoring of video and audio signals.
- Convenient access to non-confusing controls during presentations.
- Usable surface(s) for books, notes, computer, demonstration set-ups.
- Internet connectivity for use during class presentations.
- Acceptable environment for students, teacher and technology:
  - Adequate room lighting to detect true colors (4100°K fluorescent lamps work well)
  - Adequate front and back lighting of teacher station (halogen track lights work well to augment under lighted areas and chromakey surfaces)
  - Acceptable studio temperature and humidity levels
  - Low noise level (mechanical, adjacent spaces, people)

The design and construction of a teaching station can take many forms. A sample is presented in the diagram on the following page. Two stations of this design have been constructed (in-house) and are being used by MCC. One station is connected to a conventional TV broadcast system and the second is interfaced with to a two way interactive videoconferencing network. Each station incorporates all of the design features above as well as teacher operated chromakey capabilities.

Final Words

Video distance education is one of the great professional opportunities of our time. However, it is not for the faint-of-heart or someone who expect compensation for each hour of work. I am not aware of any school or college that compensates with money for every hour spent in the development of a well prepared distance education course. A major part of the rewards of this type work is the recognition of colleagues and the appreciation and respect of students. If one does not value the professional satisfaction from such a challenge, one should seek other activities. Distance education requires enthusiasm, very long hours and hard work. The rewards can be great!

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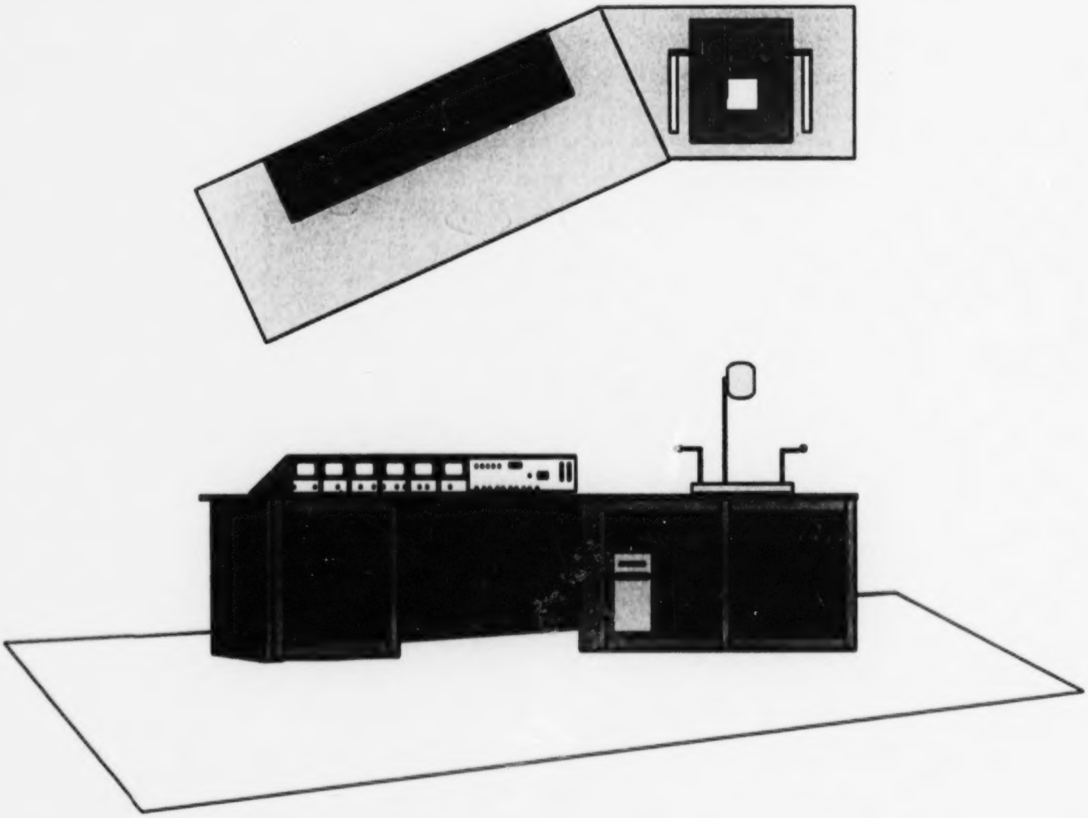

Figure 1. Teacher controlled distance education teaching station.

Web-Based Learning: Electronic Library Resources and Instruction

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Abstract

Virtual library support for distance learning and for non-traditional students is a growth area in academic libraries. Collaborative curriculum development between academic departments and infrastructure service units ensures that limited resources are implemented wisely and cost-effectively, and that students receive the guidance they need to develop the critical thinking skills that are essential for life-long learning.

Introduction

Remote access to electronic library materials is not particularly new, but the process of training remote users to utilize them effectively is. Library access is no longer bounded by a physical structure. Library information is available electronically through networks and consortial licensing agreements virtually around the clock. Although conducting library research no longer depends on the physical presence of library faculty and staff, students and faculty still need to know how to access and evaluate and use materials effectively. Instruction in the use of library is traditionally the provenance of the library's reference desk, or is available by appointment. In a virtual environment, where research is conducted remotely at times when reference support is not available, instruction librarians need to provide guidance to remote users that will enable them to use and evaluate information resources asynchronously at point-of-use. Currently, the World Wide Web is one of the best mediums for providing this guidance.

Academic librarians routinely grapple with the problem of how to provide training and help information users approach the research process critically. In today's environment students are increasingly non-residential, and more and more library materials are electronically licensed rather than physically owned. Here, instruction on demand, at point of use is necessary. Provision of bibliographic assistance is increasingly important as distance teaching and learning programs increase in number and scope, and initiatives like the Open University, the University of Phoenix, and the Western Governor's University explore options for establishing online libraries to support their curricula. In this setting, the strategic question of virtual library support becomes critical.

Collaborative curriculum development between academic departments and infrastructure service units is not regularly practiced, but it one way to ensure limited resources are utilized wisely and cost-effectively, and that they are of real benefit to the library's primary clientele. At the University of Denver, library and teaching faculty collaborate to instill critical thinking and information literacy skills in undergraduate students.

The Persuasive Voice

Each Winter Quarter at DU, students enrolled in the Freshman English Core take a required course entitled *The Persuasive Voice* (ENGG 0122). This course is designed to teach basic library and research skills. One of the outcomes of the course is the development a problem- or issue-oriented casebook that documents the students' research process. This course is time-intensive for the instructors and librarians who team-teach the course, and for the library's public services staff who must organize and maintain needed materials.

1995–1997 was a period of tremendous change in the library. The transformation of Penrose included installation of a campus computing lab in the library, migration from the old text-based CARL system to a new Integrated Library System (ILS)[1] and web-based Public Access Catalog (WebPAC), along with a team-based restructuring of the library's organizational chart. In an effort to maintain business as usual in the face of change, with PV looming, members of the library reference faculty wrote a grant proposal to DU's Center for Teaching & Learning, asking for funding to make basic web-based instructional materials available via the Penrose Library home page: http://gus.penlib.du.edu. Funds were allocated, and $2400 was set aside to supplement the hourly contract of the library's part-time web-master,[2] who had agreed to work with the reference faculty to implement their instructional designs.

The initial objective of the project was to provide immediate instructional support to faculty, staff, and students involved in *The Persuasive Voice*. The underlying intent was more far reaching, however. If effective, the project could be used as a model for provision of web-based bibliographic instruction to all members of the university community, beginning with the Freshman Core and gradually progressing through discipline-based and graduate level research. The long-range goal is to prepare curricular and research support tools that will help prepare students to critically evaluate paper and electronic information resources of all kinds, and to mount these materials on the library's home page so that they can be accessed on demand, asynchronously, via desktop.

Instruction Central

The initial BI project has grown rapidly. It is now particularly useful to the working adult students enrolled in the applied, interdisciplinary, evening and weekend programs of the University College and the Women's College which constitute one-third of DU's enrollment. Students and faculty enrolled in these programs now have licensed access to full-text and full-content information resources through campus PPP/SLIP connections. By linking to *Library Use Training* on the library's home page, off-campus students can also gain access to *Instruction Central* that provides 24-hour/7-day-per week bibliographic assistance in accessing, using, and assessing the relevance and provenance of electronic resources. They can then select the resources that most closely match their needs. Because they are web-based, the tools are uniform in appearance and students experience little difficulty in navigating them. Dialog boxes and pull-down menus are standard conventions, although enhancements may vary. Use is intuitive at the basic level, and beginning users can focus on content rather than on the mechanics of the search process which are transparent to them. Advanced instruction is still available, individually or in the classroom, by appointment for students and faculty who wish to manipulate databases in a more sophisticated manner.

Initial training tutorials consisted of web-mounted PowerPoint presentations designed to assist students and faculty during the research process. They provided instructions, scope and content notes and provided direct links to the resources themselves. Topics covered included: *The Persuasive Voice, How to Search Dialog, How to Search Nexis*, and a *Basic Orientation to Library Research*. In the course of the last year these tutorials, like the library, have evolved. A list of *Frequently Asked Questions (FAQ's)* cuts across and complements a longer, more linear explanation of the research process. The self-guided tutorial contains hot links to charts and explanatory diagrams, and includes a *Glossary* along with representative screen shots. It also includes links to related concepts. Also included in the instructional section are presentations on: *How to Search the Library WebPac, How to Conduct Web-based Research through the Penrose Home Page*, and *How to Evaluate Your Results*. In addition, library subject specialists have mounted annotated guides to specific, discipline-based research literature that contain hypertext links to subscription-based web resources and guide users to other resources, both electronic and print, that can be used to enhance the research process. Links to system and vendor-based help pages are also available, along with Helpdesk documentation from the University Technology Services (UTS). Other enhancements to the library's home page which are designed to facilitate access to library materials and services to students outside the library include options for online book renewal, electronic reference, and electronic interlibrary loan. Pilot projects to test the feasibility of user-generated document delivery requests and electronic reserves have been initiated this summer. Plans for implementing real-audio and real-video streaming and voice-overs are currently under discussion.

Evaluation

To measure and report on the effectiveness of its initial web-based training project the library reference faculty, in cooperation with representatives of the university administration,[3] developed a survey-based assessment tool. Pre- and post-tests were designed to measure the effectiveness of library instruction and the retention of material presented in the Winter 1998 *Persuasive Voice* classes. Instructors administered the surveys first, pre-tests in the PV classes, then as a post-tests. Results reflect a clear need for ongoing instruction on both the basic and advanced levels. Most students had very little initial understanding of the organization or content of the traditional library resources available to them, not to mention the complexities of virtual information. Results of the post-test were disappointing in that the ideas that seemed clear to the instructors were not always made clear to the students, but results did indicate improved understanding of basic library and information concepts. At the very least, students now know that the scope of the material that exists, and are able to differentiate between the WWW and web-based resources provided through a mediating body, like the library.

Similar methodology has been adapted to measure effectiveness of other web-based teaching campus-wide. Assessment tools currently exist as voluntary response surveys mounted interactively on the web, using CGI-bin scripting. Effectiveness of the initial project is also being assessed through documented interactions at the reference desk, in-class interaction with students, and electronic feedback forms mounted on the library's home page. Statistical packages on the Penrose server track use, and provide information about which databases are most frequently opened, how they are accessed, and how they are used. This information will be invaluable in planning for future resource implementation and electronic resource allocation.

At this point, the library has an ongoing commitment to maintain useful, up-to-date web tools. Equipment and infrastructure are in place to maintain and sustain this effort. The library has purchased a new web server, funding has been earmarked to sustain contractual systems support staff, and the Penrose Web Master is now juggling several contracts in the library. In addition, the library's web team and systems staff have incorporated plans for future web-based instruction and training into the library's regular workflow.

Notes

1. Innovative Interfaces, Inc.

2. Paolo Bacigalupi.

3. Thomas Fry, Associate Director for Services & Planning, Penrose Library; Sheila Summers-Thompson, University of Denver, Office of Assessment; Margaret Whitt, Director of Undergraduate Studies, University of Denver, English Department.

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Autobiographical Sketch

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Transcript Analysis of Computer-Mediated Conferences as a Tool for Testing Constructivist and Social-Constructivist Learning Theories

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Introduction

The presentation based on this paper will offer participants the opportunity to practice application of the authors' new model for analysis of collaborative construction of knowledge in online conferences. Participants will also have the opportunity to discuss how such analysis can inform future elaboration of constructivist theory. In particular, the authors hope to explore the question how individual construction of knowledge relates to the social construction of knowledge within a group.

The exchange of messages among a group of participants by means of networked computers, for the purpose of discussing a topic of mutual interest, is referred to as computer-mediated conferencing or computer conferencing. The use of computer conferencing as a medium for collaborative learning has in many respects outstripped the development of theory on which to base such utilization. One significant question which has not yet been satisfactorily answered is how to assess the quality of interactions and the quality of the learning experience in a computer-mediated conferencing environment. This question formed the starting point for the study described in this paper.

In addressing the question of quality in evaluating computer conferences, the authors determined that little had as yet been done to establish rationales or procedures for evaluating the actual learning which takes place during a conference, especially when that learning is defined according to constructivist principles as the co-construction of knowledge by negotiation of meaning. Other questions relating to conference quality, such as amount or pattern of participation and participant satisfaction, have been answered fairly successfully using several methods. Among them are participation analysis techniques (Levin, et al. 1990, Hiltz 1990) which analyze the capacity of a conference to engage members or which analyze comparative patterns of participation among learners from varying backgrounds. Participants' own reports of learning or satisfaction with the learning experience are also important; these may be studied as found in the transcript of a conference or by means of online or paper surveys. However, to settle for such measures in evaluating computer conferences is to overlook the unparalleled opportunity to observe knowledge construction in progress offered by transcript analysis. Transcripts give us participants' own statements, which are certainly the most direct evidence of what they know. Transcripts also give us the opportunity to follow the interaction between participants in the give-and-take of a conference; if knowledge is indeed socially constructed within a group of participants, analyzing this interaction should give us a view of how that knowledge was co-constructed in the specific instance. Therefore, in order to assess the quality of interactions and the quality of the learning experience in a computer mediated conferencing environment, content analysis or interaction analysis of computer transcripts is a new opportunity which cannot be overlooked.

The Purpose of This Paper

This paper briefly reviews the authors' attempts to find appropriate interaction analysis/ content analysis techniques to assist in examining the negotiation of meaning and co-construction of knowledge in collaborative learning environments facilitated by computer conferencing. After analyzing interactions that occurred in a Global Online Debate, the authors proposed a new definition of "interaction" for the CMC context and proposed a new Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing (Gunawardena, Lowe and Anderson, 1997).

Development of a New Interaction Analysis Model

This study was undertaken in an effort to find appropriate interaction analysis techniques to address the following two evaluation research questions with respect to computer conferences:

1. Does analysis of the computer conference transcript yield evidence that knowledge was constructed within the group by means of the exchanges among participants?

2. Did individual participants change their understanding or create new personal constructions of knowledge as a result of interactions within the group?

The new interaction analysis model was developed using a grounded theory building approach which involved analysis of the interactions that occurred in a global online debate conducted through computer conferencing. The online debate took place during the week of June 5–11, 1995, and formed part of ICDE95 Online, a virtual pre-conference to the XVI World Conference of the International Council on Distance Education (ICDE) held in Birmingham, England. The debate design invited the 554 list subscribers to participate on either the affirmative or the negative side of a statement presented by the debate leaders: "No Interaction, No Education," representing the assertion that true distance education is impossible without provision for interaction. The debate transcript is archived in the World Wide Web at (http://www.ualberta.ca/~tanderso/icde95/interaction_www/).

An important first step in attacking the above mentioned questions was to define what is meant by "interaction." The model developed by France Henri (1992) has been influential in content analysis, but Henri refers to "interactive" content as being parts of messages which specifically refer to or link to other messages within the conference. The authors believe this kind of analysis merely describes the pattern of connection among messages, and not the entire gestalt to which the messages contribute. Generally speaking all the messages in a conference are linked; all respond to each other and to the emerging totality of constructed knowledge, regardless of whether a message can be identified as responding to another specific message or group of messages. The term "interaction" should more properly be applied to the entire pattern of interconnected messages. An apt metaphor for this process is the creation of a patchwork quilt: as the pattern of the quilt is built up by assembling small blocks of bright colored fabric, so the contributions of individual participants fit together to form a unified pattern, the whole of which constitutes the interaction of the conference. So understood, interaction is the process through which negotiation of meaning and co-creation of knowledge occurs in a constructivist learning environment.

A second problem was to define a unit of analysis for use in examining the transcripts. Henri (1992) and others have suggested dividing messages into 'units of meaning' because a message may contain more than one idea. The authors experimented with analysis of the debate transcript by cutting it up into units of meaning (sometimes one statement and at other times, one or two paragraphs in a message), but ultimately concluded that cutting up a message into units did not capture the essence of meaning expressed in that message. We are all capable of holding multiple considerations, or threads of argument, in mind as we examine a subject, a fact which Henri's practice of breaking messages into "meaning units" may actually obscure; we must not without realizing it begin to view discussion artificially divided into strands of argument as a fair representation of the participants' interaction or any individual participant's learning process. We therefore decided to use the entire message as the unit of analysis.

Based on our definition of interaction as the essential process of assembling the contributions of participants into a coherent pattern in the co-creation of knowledge we proceeded to analyze the entire debate transcript for the: 1) type of cognitive activity performed by participants (questioning, clarifying, negotiating, synthesizing, etc.), 2) types of arguments advanced throughout the debate, 3) resources brought in by participants for use in exploring their differences and negotiating new meanings, such as reports of personal experience, literature citations, and data collected, and 4) evidence of changes in understanding or the creation of new personal constructions of knowledge as a result of interactions within the group. It rapidly became evident that such an analysis would involve a rather arbitrary division into phases of what in reality is a gradual evolution. However, this seemed unavoidable. Also unavoidable is a degree of subjectivity in doing this type of analysis, as researchers are clearly influenced by their own conceptual frameworks and cultural knowledge.

The analysis model developed by the authors to describe the process of knowledge creation within a computer conference is shown in Table 1. A more detailed discussion of this model, its theoretical framework, and its application to the analysis of the debate, with relevant examples, is in Gunawardena, Lowe, and Anderson (1997).

One could reasonably divide the social construction of knowledge into more, or fewer, phases than described above. It is also the case that all these steps do not always occur. In particular, where there is little conflict among the ideas held by the participants at the outset, negotiation tends to be largely unspoken; participants accept each others' statements or examples as consistent with what the group members already know or believe and the discussion may never advance out of phase one. It is also possible for conflict to occur and not reach the stage of resolution; participants may take away differing meanings, though perhaps arrived at or refined by the encounter. Moreover, Operations which we have placed in different stages of the process may actually occur at the same time. Different individuals,

Table 1: Interaction Analysis Model for Examining Social Construction of Knowledge in Computer Conferencing

Phase I: Sharing/Comparing of Information. Stage one operations include:

A. A statement of observation or opinion	[PhI/A]
B. A statement of agreement from one or more other participants	[PhI/B]
C. Corroborating examples provided by one or more participants	[PhI/C]
D. Asking and answering questions to clarify details of statements	[PhI/D]
E. Definition, description or identification of a problem	[PhI/E]

Phase II: The Discovery and Exploration of Dissonance or Inconsistency Among Ideas, Concepts or Statements. (This is the operation at the group level of what Festinger [1957] calls cognitive dissonance, defined as an inconsistency between a new observation and the learner's existing framework of knowledge and thinking skills.) Operations which occur at this stage include:

A. Identifying and stating areas of disagreement	[Ph2/A]
B. Asking and answering questions to clarify the source and extent of disagreement	[Ph2/B]
C. Restating the participant's position, and possibly advancing arguments or considerations in its support by references to the participant's experience, literature, formal data collected, or proposal of relevant metaphor or analogy to illustrate point of view.	[Ph2/C]

Phase III: Negotiation of Meaning/Co-Construction of Knowledge

A. Negotiation or clarification of the meaning of terms	[PhIII/A]
B. Negotiation of the relative weight to be assigned to types of argument	[PhIII/B]
C. Identification of areas of agreement or overlap among conflicting concepts	[PhIII/C]
D. Proposal and negotiation of new statements embodying compromise, co-construction	[PhIII/D]
E. Proposal of integrating or accommodating metaphors or analogies	[PhIII/E]

Phase IV: Testing and Modification of Proposed Synthesis or Co-Construction

A. Testing the proposed synthesis against "received fact" as shared by the participants and/or their culture	[PhIV/A]
B. Testing against existing cognitive schema	[PhIV/B]
C. Testing against personal experience	[PhIV/C]
D. Testing against formal data collected	[PhIV/D]
E. Testing against contradictory testimony in the literature	[PhIV/E]

Phase V: Agreement Statement(s)/Applications of Newly-Constructed Meaning

A. Summarization of agreement(s)	[PhV/A]
B. Applications of new knowledge	[PhV/B]
C. Metacognitive statements by the participants illustrating their understanding that their knowledge or ways of thinking (cognitive schema) have changed as a result of the conference interaction.	[PhV/C]

for example, may be proceeding at different rates through the process and may be giving inputs which belong to a stage through which most participants have already passed. It is also possible to find messages which straddle the divisions between phases, including within a single message, units of meaning which could be assigned to different phases. However, we believe the same objections could be raised to any possible division; the outline in Table 1 has at least the virtue of relative simplicity.

In using the model, one may simply read through the transcript, marking each message in turn with the letter and number of the phase to which it belongs, and noting the phase ultimately reached by the conference. Further information can be gleaned by noting the number of messages occurring in each phase as the conference proceeds.

The authors at first hypothesized that a rough judgment of the quality of a computer conference could be based on the degree to which the conference proceeded through all five of the steps, and an assessment of an individual's learning could be based on the degree to which that individual remained active through all phases of the conference, the individual's knowledge development paralleling the co-creation of meaning within the group. More recent work, however, (e.g., Anderson and Kanuka, 1998) has brought forth the point that participants often express satisfaction with conferences, and state the belief that they have learned from the conferences, even when the conferences do not progress beyond phase two in the model above. There is also ample evidence in the literature that individuals feel they profit from conferences even when they do not actively contribute to them—that is, by "lurking," or silently taking in the contributions of others.

The authors propose that this may point up an unexpected value of the model: it may serve to illuminate the connection between the individual's construction of knowledge and the construction of knowledge within the group. This is an area of some confusion, even in the terminology used to describe the two phenomena: the term "constructivism" is used variously to describe either individual or group knowledge creation, with a term such as "social"—sometimes appended to distinguish that construction which occurs at the level of the group.

The authors are now exploring whether in fact the operations they have assigned to phases three through five are more characteristic of the creation of "new" knowledge at the level of the group, or the assignment of meaning to phenomena for which the group does not yet have a common understanding. This would be consistent with the type of conference in which the model was originally developed: The online debate was designed as an adult professional development experience and participants were either practicing professionals in the field of distance education or graduate students conducting research in the field. The participants could be described as a group of professionals of roughly equal stature coming together to contribute their knowledge, negotiate meaning, and come to an understanding about an important issue in the theory and practice of distance education—an issue regarding which there is presently no commonly-held set of principles or meanings within the group. Therefore, the interaction that occurred among the participants could be described as a collaborative construction of "new" knowledge through social negotiation, or a constructivist learning experience at the group level. The authors were surprised and impressed, in studying the debate, to recognize the strength of the pull within the group toward compromise and resolution, or construction of a common body of knowledge regarding the debate topic, despite the debate format which was designed to keep the sides apart.

If the later phases of the model identify knowledge creation and meaning negotiation which are more likely to occur at the group level, it also appears that activity at levels one and two of the model reflects individuals' creation of their own understandings of the group's body of knowledge (sometimes referred to as their "appropriations" of the group knowledge). If this is so, phases one and two serve as the opportunity for the individual to "transform" knowledge previously acquired by stating it in his or her own terms, and to test his or her statement of understanding against the shared standards of the group. A measure of learning by accretion—of assembling additional instances of a principle which is already understood—or elaboration also takes place at this level.

The relationship between individual and group knowledge construction, and the degree to which conferences may serve as opportunities for "cognitive apprenticeship," in which new cognitive schema are modeled by other participants, are both important questions in advancing our knowledge of fundamental learning processes. The analysis of computer conference transcripts is a tool of exceptional promise in investigating such questions, and the authors therefore hope that further use of their transcript analysis model will prove fruitful.

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Autobiographical Sketches

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National Telecommunications Advisory Committee (NTAC): A Model for Developing a National Union and Company-Sponsored Degree Program

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Program Description

The Council for Adult and Experiential Learning (CAEL), Bell Atlantic, Communications Workers of America (CWA), GTE, International Brotherhood of Electrical Workers (IBEW), SBC, and U S WEST Communications have joined together to form the National Telecommunications Advisory Committee (NTAC). The purpose of the Committee is to design and implement an innovative on-line degree program in telecommunications. With the recent addition of Bell South to the group, NTAC members now represent a majority of the companies and union districts in the telecommunications service provider industry—helping to ensure that input and participation in the program is nationwide. Membership in NTAC is open to all companies and unions in the telecommunications industry. The Alfred P. Sloan Foundation has provided funding for the planning and development of this program.

This distance learning program will be the first industry-standard Associate of Applied Science degree in telecommunications delivered entirely in an on-line format. This unique program is targeted to workers in the telecommunications industry—both management and those represented by CWA and IBEW. The program will also be made available to individuals who wish to enter the industry. Whenever possible, the program will be articulated with two and four-year colleges and universities across the country.

Among the innovative features of this program are the following:

- It will be entirely *delivered over distance* through an asynchronous learning format, allowing students to work without the constraints of time and location, thereby increasing the factors that contribute to retention and success for working adult learners.

- The design and content of courses will be *union and industry-sponsored*. Therefore, graduates will have the specific skills and knowledge that companies in the industry are seeking. This feature will also ensure that the curriculum remains responsive to changes in the industry.

- The program is *directed at an incumbent employee population* that has guaranteed tuition assistance, thus removing financial barriers to participation and increasing the program's prospects for growth and financial stability.

In addition to the above features, there are also other components that the partners have agreed are crucial to the success of the program: (1) the program will offer a certificate option; (2) in an effort to benefit program participants who have substantial industry experience, there will be *a Prior Learning Assessment (PLA)* component; and (3) the partners are committed to and will actively pursue a *diverse student body*.

Summary Business Case: Why Develop an On-Line AAS in Telecommunications?

Since deregulation, the combination of changing technologies and new products, increasing competition among new market entrants, and growing consumer demand for higher quality service, has had a profound effect on the way the telecommunications industry works and the way individuals perform their jobs. These industry-wide factors have created new and more demanding skill and ability requirements for both current and future telecommunications workers.

One of the main challenges in addressing this skill need is how to increase participation in education programs among existing workers given the various access barriers that many working adults face. These barriers include work schedule, family commitments, and distance from campus. Overtime work (both mandatory and optional) and irregular shifts for field technicians are also major barriers to a telecommunications worker's ability to attend traditional classes that meet in a set place at an established time. In addition, many telecommunications workers live in rural communities, far from the nearest education provider.

These factors convinced NTAC members that what is needed is a widely accessible telecommunications degree program that provides state of the art, industry-driven instruction in a format that will allow individuals to work at their own pace, at home or at work, encouraging the greatest possibility of retention and success.

How the Program Will Work

The program host will be Pace University, a leading institution in the field of distance learning and telecommunications education. As the host institution for the project, Pace will be accountable to the NTAC partners. Prior to introducing the program on-line, Pace will adapt the selected courses to an on-line format and create a program Web site. The host will also work with NTAC to finalize operational guidelines and procedures for the degree program. Once the development phase is complete, the host will be responsible for housing and maintaining the program on a server, providing faculty and providing on-line student-related functions such as admissions, registration, financial aid, book and lab orders and student services.

The CWA and IBEW will coordinate national marketing for the program and provide ongoing curriculum design support. The companies will, as appropriate, link the program to internal education efforts, and will also serve as a resource to update the program curricula. The unions and the companies will share the responsibility for providing mentors for students. CAEL will provide overall project management support and will continue to organize and facilitate meetings of NTAC and will also provide staff support to the sub-committees of NTAC.

Once the program is established, regional partner institutions may be asked to join the project in order to provide additional course options and provide a local presence for the program.

About CAEL

The Council for Adult and Experiential Learning (CAEL) is a national leader in the field of adult learning. Since its founding in 1974, CAEL has been providing individuals and organizations with the tools and strategies they need for creating practical, effective lifelong learning solutions for their education and training needs.

CAEL has over a decade of extensive experience in assessing the workforce education needs of businesses and providing long-term solutions which draw the employer, its unions (if applicable), its employees, education and training providers, and CAEL together into a partnership.

Out of CAEL's experience in the arena of employee growth and development, several other organizational activities have emerged: *Consultative Services* to the educational, business, government and organized labor communities; *Research* on effective learner-centered programs for educational institutions; and *Policy Initiatives* that promote public and private-sector policies responsive to the needs of adult learners, and *working* adult learners in particular.

CAEL is also a leading publisher in the fields of workforce development, adult education, and Prior Learning Assessment (PLA). With a membership of over 600 colleges, universities, corporations, labor unions, associations and individuals, CAEL is headquartered in Chicago and also maintains offices in Denver, Philadelphia, Cleveland and New York City.

Autobiographical Sketch

Christopher Hartung-Ciccolini is a Project Manager at CAEL. He supervises many of CAEL's Internet projects and partnerships—with specialized experience in project design and start-up and web site development. In addition to serving as a project lead for the NTAC, he is currently managing the development of a new web site for CAEL. He holds a BA from Yale University and an MS from DePaul University.

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The Center for Legal Studies

Introduction

For over 18 years Scott Hatch and The Center for Legal Studies have offered classes at universities throughout the nation geared toward training the non-lawyer and aspiring lawyer in the field of law. Through his many years of teaching, Mr. Hatch became aware that there was a need to go beyond the traditional live-lecture format to reach students who for various reasons were unable to attend live lectures. His first step toward implementing a distance learning program was simple. Various universities merely taped his live lecture class. Although the taped course s were amateur productions, their overwhelming popularity demonstrated the great demand for non-traditional educational experiences. No longer were potential students limited by career or family commitments, lack of transportation, or physical disabilities.

Motivated by students' requests, Mr. Hatch expanded his distance learning alternatives. He completely renovated his video course for national airing on PBS stations, created an interactive course on CD-ROM, and recently began offering courses entirely over the Internet. Throughout the process of expanding learning options, Mr. Hatch has been resolute about maintaining the high quality, academic rigor, and exciting teacher/student interaction inherent in his live lecture offerings. Over the years, especially with the recent advances in technology, recreating the live lecture experience in distance learning has become increasingly easier and more efficient. The overwhelming satisfaction of the students enrolled in his courses at ninety universities nationwide verifies the effectiveness of Mr. Hatch's curricula and teaching style.

Challenges to Effective Distance Learning

The first question potential students ask when considering distance learning is usually, "Will I get as much out of distance learning as I would in the classroom?" Students' biggest concerns are whether they will miss the interaction with the instructor and the other students and whether they will have adequate access to learning resources such as law libraries.

Interaction Among Students and Between Students and Teacher

For many students the classroom experience is as much a social experience as it is an academic one. These students learn from each other as well as the instructor and value class discussions as an important learning tool. Likewise, many distance learning students fear that their learning experience will be compromised by a lack of direct contact with their instructor.

Access to Learning Resources

As do many distance learning courses, our courses require that students conduct outside research. Students in the Paralegal Certificate Course must do extensive research of cases and statutes. The most common forum for this research is in a county or university law library. Often distance learning students, especially those in small towns and rural areas, have limited access to a law library housed within a building.

A potential lack of personal interaction and limited access to outside resources are indeed impediments for the distance learner. Luckily, modern technology is available to overcome these obstacles.

Solutions to the Obstacles of Distance Learning

Although traditional means of communication still play a part in providing effective student support, modern advances in computer technology and media presentation have greatly improved the distance learning experience. A broad mixture of the new technologies gives students the ability to virtually replicate the live lecture experience.

High Quality Video Production

To personalize the presentation of its courses, The Center for Legal Studies partnered with PBS in its most recent video production "Law for Life." A set designed to reflect a comfortable law office maintained the formal atmosphere of a law course while providing a warm setting for a traditionally formidable subject. Mr. Hatch's "arm chair" explanations personalize the material; it appears as though he were chatting in the students' living rooms with them. Mr. Hatch was able to further personalize the material by incorporating street interviews and enlightening example scenarios to embellish his explanations. And for those students who are unfamiliar with the law library, Mr. Hatch provides a video tour.

Internet Connections

In addition to providing more personalized presentations, The Center for Legal Studies further enhances the student's learning through the use of the World Wide Web. The increased availability of the Internet has greatly improved the distance learning experience by increasing the opportunity for interaction and opening up the availability of research materials.

E-mail. Even computers with limited Internet capability support e-mail, making e-mail one of the easiest ways to enhance student interaction with the instructor and other students. E-mail overcomes time differences and provides a much quicker and less expensive communication than "snail mail" or telephone calls.

Bulletin boards. For students who have the capability of communicating via a bulletin board, interaction is even more immediate. Bulletin Boards provide students with the opportunity to engage in class discussion and simulate a classroom like environment.

Chat rooms. Chat rooms provide virtual classrooms. Interaction is free-flowing and conducted in real time. Chat room discussions may even be preferred over live classroom discussions for those students who are easily intimidated by the opinions of others.

Internet research. The Internet can also be used to facilitate student research. Instead of traveling to distant library locations, students can access cases and statutes online.

Enhancing Use of Traditional Methods of Communication

For distance learners who may not have access to computerized technology, there are still ways to increase interaction. Broadcast Fax has many of the same qualities as e-mail, and telephone calls allow the students to make direct contact with the instructor.

Conclusion

Mr. Hatch will address the specific ways that instructors can use all of the above-mentioned support systems to strengthen the distance learning experience. Clearly modern technology has greatly enhanced distance learning. In fact, with the rise of Internet use, distance learning may even become more personalized and interactive than large live lecture courses, and with future developments, it is highly likely that distance learning will be the preferred educational venue of the 21st century.

Autobiographical Sketches

Scott Hatch, J.D., has been offering paralegal and law programs nationally since 1980. His live lecture courses are currently offered on a credit and non-credit basis through over ninety universities and colleges across the United States. Students worldwide are enrolled through his correspondences courses offered online, through videotape and CD-ROM, and on many PBS stations. He is listed in *Who's Who in California* and *Who's Who Among Students in American Colleges*, and he has been named as one of the Outstanding Young Men of America by the United States Jaycees. He is the editor of several award winning publications, contributing editor to the *Judicial Profiler* (McGraw-Hill) and *Colorado Law Annotated* (Lawyers Cooperative) series, and co-author of *Paralegal Procedures and Practices* (West Publishing), *A Paralegal Primer*, and other law publications.

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Implementation and Outcomes of an Interactive Web Module

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Introduction

Distance Education has played a major role in extending traditional classrooms to virtual environments. The main objective of distance education has been to extend resources available to learners beyond local or regional settings. Widespread uses of technology and computer networks have made it possible to deliver content to meet learner expectations, needs, and outcomes. Moore (1991) reported that distance education is not merely traditional learning and teaching using new technology but a transaction between teachers and learners involving interplay among the environment, the individuals, and their patterns of behavior.

The new model of distance education is based on interactive technologies where there is active participation and interaction between faculty and students, students with other students, and students with electronic books, journals, and multimedia resources. This interaction need not take place in the classroom—instead it provides students an opportunity to control learning at their own pace and time, and also accommodate individual learning styles. In order to accommodate these non-traditional students, a virtual learning environment that meets their needs must be designed. The goal is not to use technology by itself, instead to use technology to enhance learning.

Project Objective

This paper describes interactive Web based instruction developed for an Educational Psychology course. In Fall 1996, an interactive web page was planned for the *EDUC 539: Psychological foundations of Adolescent Development and Learning* being taught at George Mason University. The course deals with study of theory, research and practice relating to adolescent development and learning. This page is located at http://mason.gmu.edu/~dschnorr. Some of the interactive elements built into the page were Javascript, Animated Gifs, Downloadable files, web based testing, and web conferencing. Benefits of using these elements are given below:

- Students in the course could download lecture notes as well as critical thinking questions. In the typical classroom, lecture notes are given at a fairly rapid pace. When provided the opportunity to download a hard copy of the main ideas to be discussed in class, teachers can save in-class time to model the concepts, have students apply the concepts as well as engage the students in deeper level and higher order processing. Analytical and synthesis levels of the cognitive domain comprise essential components to the overall development of higher order thinking skills, yet teachers rarely engage students beyond the knowledge level (Elliott, Kratochwill, Littlefield, Travers, 1996). Additionally, teachers can assign specific questions to students who may need more time for processing information. Exemplary models of former students' work can also be placed on the home page as downloadable files.

- Web Based Testing takes Computer Aided Assessment one step further by using Web servers to deliver tests and store student responses in a database. Instructors can tailor their questions to reflect the type of objectives they are covering in their course. The web based testing in EDUC 539 course proved to be invaluable. Students were given a solid framework as a review for their mid-term exam, and were also able to monitor their own understanding of concepts by comparing their responses to the correct answers. This Web based testing represents a cognitive behavior modification technique designed to help students develop goal setting behavior, planning, and self-monitoring (Good & Brophy, 1995), and provides the opportunity for students to master the concepts (Bloom, 1981).

- Web Conferences are similar to bulletin board discussion groups or Usenet newsgroups. Within the classroom, Web Conferences were used to create small group discussions organized either by topic areas or student groups. Participants were able to post, reply, send e-mail messages, attach files, and host real-time chat discussions. The course instructor moderated discussions and provided direction to the topic being discussed as well as answered questions posted to conferences by students. The course instructor also included professionals in the field within the Web Conferences, which led to the creation of a community of learners beyond the physical boundaries of the classroom.

Empirical outcomes resulting from the use of Web page in the EDUC 539 course were extensive. Evidence of the success of this interactive home page stems from observations of in-class interaction and discussion of course content as well as student growth in meeting course evaluation criteria. Students were better prepared for in-class discussions due to the downloading capabilities of lecture notes and critical thinking questions. In-class lectures were more organized and lead by student discussion. The students' understanding of concepts became more intricate and analytical in nature because they had time to think about the critical thinking questions, and engaged in elaborate communication about those concepts outside of class time. The interactive web page designed for the EDUC 539 course opened up a window of opportunity for students to gather a multitude of resources when researching specific topics and/or extending their understanding of concepts beyond what the textbook offered. Use of the homepage assisted the students' critical thinking because they were able to access a variety of sources representative of theoretical and research knowledge, as well as practitioners' perspectives and actual practice. Specifically through the use of the Internet, students developed their knowledge by engaging in disciplined inquiry. According to Bruner (1990), disciplined inquiry helps students discover the authentic and complex components to any concept or research topic. An interactive web page designed carefully can produce this form of disciplined inquiry and provide authentic learning contexts for the students.

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Autobiographical Sketches

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Cyber-Evaluation:
Evaluating a Distance Learning Program

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Introduction

The Army Management Staff College offers a resident course in leadership and management for civilian employees of the Army. The course is designed to provide senior civilian leaders with the skills, knowledge and understanding of the "Big Picture" required to make critical decisions in the workplace of today and prepare them for senior level positions within the Department of the Army or other government agencies. Since 1995 the college has offered a one year nonresident version of the program. Since the inception, determining how best to solicit evaluation feedback from the students has been a challenge. This paper will examine how the process has evolved since 1995.

Course Design

Students are divided into 5 seminars with approximately 16 students and a full-time faculty leader. Seminar members live all over the United States, as well as Korea, Japan, and Europe. Students attend a one-week resident session at the beginning of the program and another one-week session at the conclusion. In between, instruction is primarily paper based. The content is divided into 4 segments with graded assignments required for each segment. There are two video-teleconferences during the year with videos provided to those students unable to attend the sessions. Students have also been provided access to chat rooms, an electronic bulletin board and library, as well as e-mail to supplement the paper materials. Most seminars schedule weekly study sessions in the chat room with logs being posted in the library for those unable to attend.

Evaluation Plan

From the beginning the plan was to evaluate the nonresident program the same as the resident program. Student surveys be administered for at the end of each resident session and periodically throughout the year. In addition, a graduate survey would also be distributed 6 months after graduation and a survey sent to supervisors one year after graduation. One of the advantages of using the same evaluation strategy is the ability to compare data on the graduates of both programs to determine if supervisors and graduates themselves respond differently.

Student Surveys

Nonresident class 95. For NR 95, surveys for the 2 resident sessions were administered using paper and Scantron forms. Surveys were administered at the conclusion of each of the 4 segments of the curriculum. For the first survey, many of the questions were taken from surveys developed for the resident program. However, analysis of the responses showed a definite difference in responses between resident and nonresident students on the same items. In addition, responses that had not been anticipated were needed for some questions.

An example is the questions on the quality of feedback provided to students on their assignments. While the concept was for faculty in a week or two, this was not happening and many students had not received feedback on all assignments prior to the survey. As a result the questions were modified for the second survey and focused on whether the program was working as planned (i.e., students receiving feedback from one assignment prior to the submission of the next) as well as the quality of the methods, materials, and experience.

Prior to the second survey, students obtained access to the electronic facilities. Therefore, the survey was also available for them to download form the library as well as being mailed to them. They could respond electronically or via mail. The same procedures were used for the third and fourth survey. Only 2 or 3 students opted to submit their results electronically. The fourth survey was due about 2 weeks before the final resident session. The response rate for this survey was only 35%, far lower than any of the other three where response rates ranged from 72% to 58%.

Nonresident class 96. Surveys were again administered for each of the resident sessions using paper and Scantron forms. The number of surveys administered while the students were off-site was reduced from four to three. Because of the low response rate for the final survey of NR 95, the decision was made to include questions on the final segment of the curriculum completed off-site in the survey for the second resident session. In addition, the survey administration changed from paper-based to disk. Each student was mailed a disk with the survey on it. They completed the survey and mailed it back in a post-paid disk mailer. While the return rates using this method were comparable to the paper-based surveys of NR 95, there were problems. The only software available that could handle open-ended responses was DOS based while most students were more comfortable with a Windows environment. In addition, one student had a Macintosh that the software would not run on. This problem was resolved by mailing a paper copy to the one student. During each administration, a number of diskettes were damaged during mailing. While 99% of the data was recovered, the process was time-consuming.

Nonresident class 97. Again, the resident session surveys were administered using paper and Scantron forms. However, the three off-site surveys were administered via the World Wide Web. The surveys were attached to the AMSC web site but could only be accessed with the URL. Once the survey was in place, each student was sent an e-mail with the URL address and the date when the survey would no longer be available. The responses were fed into a database that could then be entered into statistics software for analysis. However, return rates using the web are lower than for the other methods with the exception of the fourth survey. For the fourth and fifth surveys a competition was implemented between seminars with the results posted periodically during prior to the due date (Table 1).

Student response to the competition was very positive and the concept will be continued for the next nonresident program. During the administration period for the second survey, there were problems with Internet access to Fort Belvoir. As a result, the AMSC server was down for several days. Once the connection was restored, problems continued with sporadic interruptions of service for several days. In an effort to determine why responses rates were so low for the early surveys, questions on the web survey were added to the final survey. Unfortunately the responses provided little explanation. Most, 71%, of the students said they had no problems accessing the survey at the web site and there were few recommendations for improving the process.

Table 1. Return Rates for Student Survey

	NR 95		NR 96		NR 97	
	Method	Return	Method	Return	Method	Return
Survey 1 (Resident Session)	Paper	92%	Paper	92%	Paper	92%
Survey 2	Paper	72%	Disk	71%	Web	51%
Survey 3	Paper	64%	Disk	65%	Web	52%
Survey 4	Paper	58%	Disk	59%	Web	70%
Survey 5	Paper	35%	Combined with 6		Combined with 6	
Survey 6 (Resident Session)	Paper	91%	Paper	96%	Paper	99%

Nonresident class 98. Resident sessions will again be paper based and the web will continue to be the primary method of administration. However, students who can not easily access the web or are not comfortable using this method will have the option of completing the survey via e-mail. Software has been purchased that allows for the development of a survey to be delivered via web or e-mail and consolidation of results from both methods into a single database. In addition to adding e-mail capabilities, it eliminates the requirement for a programmer to be involved in the process.

Graduate Surveys

Graduates of the first two nonresident programs were surveyed 6 months after graduation the same as graduates of the resident course. The timeframe for administering graduate surveys is being changed for classes graduating in 1998. Surveys will be administered for both resident and nonresident program graduates in September 1999. Because of the nature of the program, graduates continue to receive surveys periodically after the initial graduate survey at 3 to 5 year intervals.

The questions dealing with the usefulness of the topics taught in the course and perceptions of how well AMSC has prepared them for the workplace were the same as those administered to resident course graduates. Questions dealing with the design and focus of the course were modified to reflect the differences in the delivery of the courses. However, the final result is six questions were removed for the nonresident graduates and three new ones added.

In general, while the responses from the nonresident graduates in NR 95 and NR 96 are positive, they are lower than those from resident course students. This is especially true for items dealing with how well the course prepared them to think critically and make decisions, two areas that are difficult to replicate in the nonresident environment.

Supervisor Surveys

Like the resident course, the supervisors of nonresident graduates are surveyed one year after graduation. Supervisors are asked to evaluate the knowledge of the graduate on subjects taught in the curriculum as well as the potential of the graduate for senior level positions. The questions are exactly the same as those used for the resident program.

The results for almost all items are higher from supervisors of nonresident graduates. Only one item, which deals with the graduate's ability to manage change, was rated lower for the nonresident class (Table 2).

Table 2. Comparison of Supervisor Responses

Survey Item: The graduate understands how the organization manages change.				
	95-3	96-1	96-2	NR95
Strongly Agree/Agree	83%	82%	96%	75%

Results

A report is prepared for each survey administered. Copies are distributed electronically to the Dean of Academics, Commandant, and Department Chairs. In addition, a copy is placed on the LAN where it is accessible to all staff and faculty. Course developers and college management has been encouraged not to react to the responses from a single survey. Instead they should look for trends across classes and this type of information is contained in the report when appropriate. In addition, responses from the various sources are compared. The graduate surveys are compared to the results of the student surveys for the class. Results from Nonresident surveys are compared to the comparable resident group. Results from supervisors are compared to those of the graduates on similar items. By looking at similarities and differences between multiple sources, a better picture of the effect and impact of each course is available.

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Autobiographical Sketch

Denise L. Henderson is currently the Director of Evaluation at the Army Management Staff College (AMSC). She has 18 years as a training developer at Soldier Support Center, the U.S. Army Engineer School, as well as AMSC. Denise established the Directorate of Evaluation at AMSC and developed the evaluation plan covering all courses conducted by the college.

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The Search for Quality Standards in Distance Learning

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Walden University has been delivering non-traditional graduate education to adult learners for 27 years. From 1970 until 1995 Walden granted strictly doctoral-level degrees utilizing a dispersed residency format. The dispersed residency model was once known as "open" or "correspondence" learning. Assuring quality in such a non-traditional, distance model was highly dependent on the quality of the faculty and the mentoring relationship established between the faculty member and the students.

However, with the increasing availability of technologically based means of communication and the rapid development and sophistication of distance education and distance delivery this all changed for Walden University. In 1995 new requirements were instituted for students and faculty grounded in telecommunications. In addition Walden University began offering two new online, course based programs. One a Ph.D. in Professional Psychology, the other an online Master of Science degree in Educational Change and Technology Innovation (ECTI). While these two course based, online programs did not change the mission and vision of Walden University, they clearly have affected the process, procedures and delivery of instruction at Walden University. This paper is an exploration of the issues surrounding quality in higher education and its necessary adaptation to the online world of educational delivery.

Historical Perspective

Quality standards and processes have been available in other industries for decades. These quality processes are highly sophisticated in the manufacturing industry with such well known scholars as Deming and Juran. However, many of the traditional quality models, in education, focused only on the pedagogical factors. The International Council for Distance Education said of quality: "The focus for designing quality distance education should be on the content, the learners, and the learning outcome" (Hardy, 1997). While this author would agree, it appears that this is not enough for a quality distance education program.

Keegan and Rumble in a 1982 study (Verduin & Clark, 1991) established quality indicators as the learner outcomes. Gooler (1979) in looking at quality and distance education felt the important variables were affective skills and the drop out rate. For many institutions, both traditional and distance, it was clear in reviewing quality there was disagreement on what should be evaluated (Verduin & Clark, 1991). Traditional quality standards often included entrance requirements, famous graduates, reputational rankings, illustrious faculty (West, 1984), the value added to graduates, and the level of involvement of students in academic and extra curricular activities. It is easy to see the similarity of these criteria with criteria of accrediting groups in their evaluation of academic institutions. Keegan and Rumble (in Verduin & Clark, 1991) established a set of criteria for distance institutions. These criteria may be useful for the non-traditional correspondence program but a shortcoming is the obvious lack of factors dealing with technology for today's distance delivered programs.

- Quality of the learning materials
- Stability of the subjects taught at a distance
- Cost effectiveness
- The status of the institution

Recent Models

The American National Standards Institute recently applied the American Association of Quality Control international standards (ISO9001) to education and training institutes. These include both traditional and non-traditional delivery models.

- The curriculum specifies expected outcomes.
- Quality systems should be kept simple.
- Precise measurement is essential (quality control).

Only since the beginning of the 1990's have we begun to see the introduction of technology as an important criteria in the quality literature for distance education. However, an earlier reference to the importance to the delivery method by Baldi in 1976 stated, the "method of curriculum delivery serves a critical function in legitimizing such program" (In Poppenhagen, 1986).

- Materials must be learner friendly.
- Materials must be interesting.
- Materials must elicit the appropriate rigor.
- The materials must be relevant.
- The technology must be available.
- Teachers and students must be familiar with the distance methodology.

Hawkes and Duning et al. Models

As the result of this attention to pedagogy, content and delivery a few authors have addressed the aspect of ethics as it affects quality in programs. Duning, Van Kekerix, and Zaborowski in 1993 chose three criteria encompassing the functional, managerial and instructional quality of distance courses. Hawkes (1996) in *Criteria for evaluating school based distance education programs* discusses both the technological aspects of quality and the ethical aspects by discussing four criteria as critical. A comparison of these quality criteria is shown in Table 1. Ethical aspects of quality are a component of each model. Ethics as instruction and ethics as related to access issues.

By combining the Hawkes (1996) and the Duning et al. (1993) models it will be possible to discuss the comprehensive quality model utilized by Walden University. As Lewis (1988) said "As learning systems become more complex quality control and service management of the customers experience will become increasingly important" (Moore, 1990, p. 53).

Managerial Quality/Organizational Criteria

How Does Walden University Lead?

One of the questions infrequently connected overtly to the quality of educational programs, especially online distance programs, is the question of leadership. However, the mission, vision, foundational values and leadership support the overall standards of acceptable quality within any educational program. This is closely related to the allocation of resources for quality. Resources at Walden University include a dissertation editor, Quality Center of Excellence, an online writing center, and regular a program evaluation and review process. Commitment of resources to quality must be supported by the leadership of the organization.

Table 1. Quality Criteria

Duning et al. (1993)	Hawkes (1996)
1. Functional Quality	1. Technological Criteria
a. Technical	a. Ease of use
b. Design	b. Speed of Access
	c. Level of realism
	d. Flexibility
	e. Time place independence (Stubbs & Burnham, 1990)
2. Managerial Quality	2. Organizational Criteria
a. Policy	a. Maintenance
b. Leadership	b. Scheduling
	c. Support availability
	d. Staff development
3. Ethical Quality	3. Instructional Criteria
a. Instructional aspects	a. Interactivity
	b. Integrative capacity
	c. Learner control
	d. Learner-instructor relationship
	e. Learner achievement
	4. Ethical Criteria
	a. Access

How Does Walden University Record Keep?

As is common to most educational institutions the gathering, storage and access to information is critical. Walden University is attempting to move toward greater amounts of electronic data as opposed to paper data. The institution supports an electronic student data base that includes all student information, course information, and research project/dissertation information. It also tracks application and registration information, the various approval and signature sheets necessary, advisor assignments, and changes in status. Separate programs support electronic portfolios for students, process checklists for quarterly events, periodic review information is collected for programs, and instructor evaluations are part of the continuous improvement process for faculty.

Functional Quality/Technological Criteria

How Does Walden University Support Students?

In March of 1997 Walden University re-organized into a process team model. Support and administrative functions were re-designed to fall within single process teams. Examples of process teams include: recruitment, admissions, orientation, finance, registration, progress, records, completion, and residencies. This student centered approach provides direct links for service to the graduate students of Walden University.

Ethical Quality/Instructional Criteria

How Does Walden University Teach?

This is one of the most critical components of a quality education program. Desmond Keegan (1993) in an article called *Theoretical Principles of Distance Education* discusses the importance of the relationship between the student and the faculty member. He feels it is "interaction for the purpose of identifying, understanding, confirming worthwhile knowledge" (p. 13). However what is "worthwhile knowledge"? "The difficulty with assessing the quality of distance education is agreeing on a common meaning or set of objective criteria" (Keegan, 1993, p. 10). While it has already been stated there a many influencing factors of quality, much of it is invisible to the students in the online arena. However, the interaction between the student and the instructor is not invisible. The creation of the relationship and the community of students with the faculty member in an online environment is critical to the pursuit of knowledge. It is also critical to student satisfaction.

How Does Walden University Evaluate Faculty?

Evaluation of faculty is critical to establishing a quality program. It is important to the program, the students and the faculty themselves to know how they are doing. Holmberg (1989) said there are two reasons for evaluation 1) to safeguard the highest possible education quality and 2) to assure resources are spent wisely. There are no unique problems regarding evaluation in the online area. If anything evaluation is easier as students easily adjust to responding to questions online and the ease of documentation of the interaction between the faculty and the students. Walden faculty are regularly evaluated. Students complete a program evaluation after their first quarter of the program. In each case they evaluate the services provided them by the recruitment, admissions, registration, orientation, and progress teams. In addition each course has a mid-quarter course evaluation and a final instructor evaluation. These evaluation tools are utilized in the faculty performance and re-contracting process. However, student data alone do not make up the evaluation process. In addition to the perspective and satisfaction of the students there is also the evaluation by the program director. In this case the program director is part of each course as an observer. Lastly, the instructor himself or herself writes a narrative summary and evaluation of their performance at the course conclusion. These three perspectives, student, teacher and administrator are used to fully evaluate the course related to both satisfaction and to quality outcomes.

How Does Walden University Empower?

The empowerment of all the participants is an important ethical aspect of quality in an online educational program. Because of the independence of all the participants in an online educational program it is important that they feel empowered. Students must be empowered to make their own decisions. Faculty must be empowered to adjust the course to follow the cconstructivist model, administrators must be empowered to intervene with students or faculty when appropriate, and support process teams must be empowered to meet the students needs.

Conclusion

It is clear that a quality assurance program is vital to the ongoing success and the fiscal requirements of online educational programming. It must be continuous and permeate all aspects of the delivery and content of the program. It must be evidenced by the leadership of the institution, the faculty, the curriculum, the materials, the delivery model and student services. An institution could create a model based only in quality of the classroom, but it will fall short in other critical areas of assuring success for students.

It is the tension between being a student centered institution and having integrity that can give administrators their greatest challenges. This model, in which the managerial, functional and ethical (Duning, et al. 1993) aspects of quality are explored through a series of questions is one way to develop a quality program. The ECTI program at Walden University is able to answer each of these questions for its program, the faculty, the delivery and the students. As the program continues to develop it is clear the commitment toward quality by all the involved constituencies is in place. The retention is high, the satisfaction is documented in the student responses and the faculty commitment is in place. Students currently are progressing through their program, their research projects and are able to find success at Walden University. Quality assures student success, faculty success and program success will only continue.

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"Showing Them the Ropes" Re-Visited: Delivering On-the-Job Training at a Distance

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Background

This case study describes the implementation of a structured on-the-job training (OJT) program for new technicians in the industrial gas business. The technicians are responsible for the safe operation and reliable supply of small, self-contained plants which produce gas. These "standard plants" (about 415) are located on customer sites which are dispersed throughout the United States. Typically, a technician is accountable for two to five plants depending on the size.

The Request

The client's desire was to standardize, quicken and improve the training for new employees. The performance goal was for the technicians to run their plants independently, meeting safety and reliability standards.

The Challenges

At the start of the project, training for this group was a typical OJT approach in which "Annie shows Joe the ropes." This was supplemented with some formal classroom instruction. The predictable results of lack of consistency, evaluation, focus and accountability were prevalent. Some of the technicians did not even benefit from "Annie's" attempted assistance but rather had a brief orientation by their manager, were given a tour of their new plant, were given a truck and sent to their plant often times hundreds miles from human contact.

As with most businesses, managerial, administrative and educational support has dwindled over the years. Due to the success of this type of plant, however, new technicians were being hired at a rate of 20–25 per year with little strategy as to how to teach them to meet the performance goals successfully. Not surprisingly, some regions of the country did better at orienting new employees than others.

Throughout the process, the training team was well aware of the critical success factors needed for this program. They include:

- Correct identification of necessary skills and knowledge for a technician
- Availability (time, proximity, quantity, etc.) of mentors and students to work through the program
- Managerial support
- Involvement of Area Managers
- Orientation and training for the mentors
- Verification and demonstration of knowledge and skill acquisition

The Tools

A team of technicians, an Area Manager and an instructional designer was formed to work on the project. The team's work began not by deciding what new training programs were needed but with further discussions about the performance needs and work conditions of a new employee. A task analysis was completed since there was no documentation of what new employees do, the importance of those tasks, etc.

It was also decided that the best approach was to use experienced technicians as mentors to deliver OJT that was structured, consistent and measured. These more senior technicians had performed this function in the past with few tools at their disposal. Even with these limitations, some mentors had been successful in working with new employees so there were few culturally barriers in using them. Research was done to identify components of the training which could be computerized, such as testing, gaining fundamental knowledge, practicing plant functions, etc. Unfortunately, none of these were possible due to time, funding and existing computer systems. Now that the paper-based program is in place, these options are again being considered.

Using the task analysis, the first tools produced were checklists. These are used by the mentors and students as a systematic way to approach the OJT experience. The checklists segregated tasks by topic and put them in an appropriate learning order. When the student and the mentor agree that the student is proficient in the tasks on a checklist, the documentation is completed. The checklists are supplemented with mentor guidelines that describe for the mentor what the standards of performance are, how to teach various topics, resources available, etc. The student is also given the guidelines since it was felt that they, too, would benefit from the information.

Formal evaluation of the skills and knowledge on the checklists is the responsibility of the Area Manager. It was felt by the training team that the Area Manager was the most appropriate person to conduct the evaluation thus increasing contact with the new employee, giving the Area Manager a structured method to assess a new employee's progress and not possibly damaging the relationship between the mentor and the new employee if the mentor performed the evaluation.

For the evaluation, the Area Manager asks knowledge questions verbally and observes the demonstration of prescribed skills from the task analysis. During the demonstration, the Area Manager typically introduces a technical problem into the system which the student must correct. The Area Manager is given a list of criteria by which the demonstration is judged, such as safe practices, speed, identification of the problem, solving the problem, and standards for rating (duration, percentage correct, etc.)

Due to the technical nature of the job, it was identified that new employees often need fundamental knowledge about the job. To meet this need, two vendors provided self-study materials on such topics as pneumatics, process control, reading drawings and compressors. The self-study materials also included a placement test which would exempt employees from some or all modules based on their prior knowledge. New employees work through the reading and self-check exercises on their own time. After the completion of each module, the mentor administers and records the results of a written test. The technician is expected to pass these tests with 70% correct. If this is not achieved, the student reviews the material again to prepare for a subsequent test.

The final tool provided was a curriculum map. The map showed all the training components (including existing courses), a suggested order in which they should be taken and a proposed time frame for completion.

The Implementation

The implementation was done in three stages: use of the materials with two small pilot groups, revision of the materials and distribution of the program to all regions in the United States. For both the pilot and national rollout, meetings were conducted with the Area Managers and mentors. During these meetings, the materials were distributed, the program was explained and all parties were trained on how to conduct OJT with one or two individuals.

Although Praxair has existing programs for training instructors, they focused on techniques for classroom training and not on effective OJT instruction with an individual. To met this need, part of a vendor program was purchased and modified. Besides focusing strictly on OJT instruction, the vendor program utilized exercises in which the participants teach each other topics which are "content free." "Content free" topics require participants, for example, to teach each other how to construct a tinker toy object for which the student has no point of reference. In most train-the-trainer courses, the trainer teaches a task which the student already knows how to do, such as making a paper airplane or using a piece of familiar equipment. The advantage of using "content free" topics is that the student cannot pretend to learn. This forces the instructor to use good explanation skills during the exercises.

One other aspect of the rollout meetings was an explanation of how feedback on the program and its progress would be tracked. The criteria used to measure the success of the program was extent of use, time needed to complete the requirements, accuracy of the materials, results of the assessments. The program did not track improvement of specific business goals, such as better reliability. It was felt that since lack of skill is not the only factor which affected the goals, claiming a direct correlation between improved skill and business measures would be a very weak link.

The tools for gathering feedback and measuring progress on the training were an electronic tracking file and a telephone survey. The tracking file was completed by the Area Managers and showed the amount of time, progress and assessment results for employees in the program. The telephone survey was conducted by the instructor designer who contacted each technician, mentor and Area Manager in the program. The survey focused on student progress, mentor/student relationship, assessment results, observed improved performance, value of the program, appropriateness and effectiveness of the materials, barriers during implementation, and suggestions to improve a new employee's transition into the job.

The Resources

The resources needed to design, development and implement the program were travel costs, material costs and subject matter expert time. After the project was launched, the team met 4 times over a 6-month period in 1997 to design and develop the tools. Between these meetings, a majority of the work was done by the instructor designer, one subject matter expert and a graphic designer, who was not a member of the team. Three train-the trainer sessions were conducted for 14 mentors and five Area Manager. To date, 17 technicians have participated in the training.

The material costs include:

- $300.00 per technician, mentor and Area Manager for the self-study modules
- $10.00 per technician, mentor and Area Manager for manual including checklists, guidelines, etc.
- $10.00 per mentor and Area Manager for the train-the trainer materials
- $5,000.00 to purchase the vendor program for the train-the-trainer course

There were also travel costs incurred by the training team during the development and by mentors and Area Managers if they met more frequently with new employees per the new program requirements.

The Results

Based on the information gathered during the telephone surveys, the results were mixed. The respondents were almost unanimous that the program provided value and was well worth the time, money and effort to use. The respondents commented positively on its structured approach, thoroughness, accuracy and completeness. They also expressed appreciation for the availability of tools for the mentors and new employees where virtually none existed before.

One glaring barrier from the survey was the extent of use of the materials. The self-study modules were being used almost universally, but the checklists and assessments were sorely neglected. One implication of this is that very little feedback was gathered on the checklists or assessments. The few respondents who did use these tools felt they were useful and that they impacted employee performance. These comments, however, only provide limited antidotal information.

Respondents accounted for the limited use of some of these tools due to lack of time, proximity between technicians, mentors and Area Managers and lack of follow-up by management as to the progress of the program. Even though some of the tools were not used, no one advocated eliminating them from the program. Instead, the business unit hopes to make logistical adjustments so that the checklists and assessments will be used. At the time of this writing, the Area Managers are meeting to assess the survey results and identify the next steps for more extensive use of the tools.

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Autobiographical Sketch

For the past seven years, I have worked in the industrial gas business assessing, designing, developing, implementing and evaluating training programs. Major areas of application include systems, process re-engineering, safety, operations and the training of trainers. Prior to working in industry, I was a secondary history and English teacher for six years with experience in the United States and overseas. I have a bachelor's degree in history from the University of Northern Colorado and a master's degree in education from the University of Aberdeen in Scotland.

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The Invisible Barriers in Teaching at a Distance

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Teaching at a distance can be a bewildering experience. Teachers with no or only some experience in distance education frequently encounter problems they did not expect. Although distance education formats vary to a great degree, the basic classroom structure has not changed a great deal. Whether it was done on television, teleconferences, or the Internet, most of the classes are still composed of lecturing, viewing instructional material, question-answering, doing group activities and so on. A class still consists of one instructor and many students that are dutifully sitting in front of a computer, television, or projection unit.

The following study and discussion focuses on experiences with real-time communication in distance classes that contrast with the face-to-face setting from which the teachers and students brought their teaching-learning perceptions and behavior. Many people who have taught in distance education settings describe the situation as familiar but unfamiliar. They grant that the class format looks familiar: long tables, regular chairs, students sitting in rows or circles, the instructor lecturing and students listening, and once in a while, a question or two asked. Students have final exams and perhaps projects to present during the classes. While these classroom practices are familiar, accomplishing them in a distance environment can be difficult and unfamiliar.

Observing the uncomfortable and unforeseen experiences that distance teachers and students have, the authors studied the reasons behind the barriers that are apparently there but hard to describe. In the following, we draw our inferences from three distance courses using teleconferencing systems (Hsu, 1997). First we'll take a closer look at the instances, and then we will propose a view that explains the phenomena.

Problems in Three Courses

Three semester-long graduate courses in three discipline areas, Education, Agriculture, and Statistics, were studied. All of them were using audiographic teleconferencing systems that were conducted in real-time, for three hours per night, one night per week, and fourteen weeks per semester. Most of the students were new to distance learning, and only one out of the three instructors had some experience teaching at a distance. All three courses had different content, teaching strategies, and student composition, and all of them shared communication problems that became significant.

Course I

The first course was about test construction and assessment for educators. Dr. K was one of three instructors that had taught the course at a distance. He had taught the course several times on campus in the past. From the beginning of the course, Dr. K was confident in how the course should be taught and how students should learn: "I had taught the same course on telnet (an audioconferencing system) before. I have that experience with nobody around me. I am not a novice at this (teaching at a distance); I am experienced."

Dr. K felt that he knew how to present the course so that the students would learn the content material. For example, the course project was the single most important thing in the course because a majority of the class time was used to discuss and present segments of the project. Instead of giving lectures and expecting memorization, Dr. K wanted the students to engage in the process of composing, discussing, and revising even though it was a slow process. Students' progress could only be observed over time. Dr. K placed great value on the students' presentation process. He saw group sharing as the basis for their growth and improvement, "When you are showing and telling, you become more critical through time. You develop a certain set of schemas that you use to draw a conclusions about the work."

Perhaps due to Dr. K's previous experiences in teaching audioconferencing, he seldom used the color pen to draw anything on the screen, and the computer display was mostly limited to black and white text. Moreover, Dr. K spent a lot of time on student's homework, project presentations, and discussion. While these activities had work well in the past, Dr. K encountered numerous problems. For reasons he did not foresee, students were frustrated from the beginning.

Students had problems communicating with the professor from the first days of the course. For example, when Dr. K went through the course syllabus, course requirements, and the packet of readings with examples of projects, students had many questions. The audio was a little muffled at times, and sometimes students had to ask each other to repeat the questions or answers. During the first few meetings, there was be confusion regarding how to do the assignment from the examples and handouts the teacher had provided. One student stated later: "I hesitated to ask questions. Sometimes our questions weren't really answered, so we figured that we should just forget it. We were not going to ask questions anymore." Because of numerous communication problems, the instructor's ideas about the course were not fully comprehended by the students. Students did not have a sense of the whole picture.

> I didn't see a clear picture, and it was not really the course that I had expected. I was frustrated from the beginning. I think it is much easier when you have a one-on-one interaction with somebody, whether it is your colleague or your professor, to clarify the information. It is difficult to do so over distance. I don't know whether it was the information being presented or whether it was the equipment. It was probably fifty-fifty.

Some of the instructor's philosophies and strategies were not accepted by the students. This mismatch between the teacher's and students' teaching-learning strategies was further aggravated by the lack of communication. While some students struggled to understand the instructor's intent, many others gave up trying. Students with these two opposing views and attitudes formed two distinct groups. One group felt frustrated by the technology, but strived to survive the course. The other group appeared to like the course and the technology initially, but developed loud complaints. A lengthy period of arguing and shouting, complaining and criticizing in a class at the end of the semester shocked everyone. The second group revealed their long-held frustrations, anger, and dissatisfactions.

Course II

Dr. B always wanted his classes to be interactive. As a professor in a science field, he knew it was not part of the tradition of class behavior for graduate students: "Students do not ask questions, period." He encouraged interaction because he believed in its value in the education process, and because of his wish to learn more about his students: "I figure they invested a fair amount of money and time to come to the class, so the least I can do is to figure out who they are." He also saw the potential usefulness in learning more about students.

> If I know their names, I'm more free to call on them in class. When you ask a student to answer a question, other people are thinking, because they know I may call on them next. So they can learn more from each other. If I know somebody is a fertilizer dealer in my off-campus class, I can say, "Hey, John, what happens to the pH of the nitrogen when you put it on the corn ground?" Other students can then start seeing some practical value to this, or some practical connection between the real world and what I am teaching.

Dr. B used a range of strategies to connect to his students and to encourage interaction. He prepared handouts for students that were taken from the lecture notes on the screen, so the students would have something to refer to when they got lost in class or when they were studying at home. As he went through the lecture notes during the class, he circled, highlighted, pointed at the important text and graphics. Dr. B called himself "the worlds greatest doodler," as he annotated the several hundred digitized slides he had taken from the field. He often used jokes and humor to make his students feel at ease. On student reported, "Some of the stuff is corny, so it's funny. They are just kind of off-the-wall things that are humorous. If he was serious all the time , I know I wouldn't be enjoying the class as much. When you get up around my age, you enjoy humor in your work."

As much as Dr. B tried to obtain students' feedback by soliciting questions from individuals and groups, he was frequently unsuccessful. The reason for students' lack of responses, however, was not because they did not know the answers or were unwilling to answer. No one knew how to do it in this setting. As one student put it,

> He probably thinks no one answers the questions, but lots of times, if he had video, he could look around and people would be shaking their heads, saying "yes" or "no," but they won't speak up. Sometimes, just about the time I speak up, someone from one of the other locations is going to speak up also. So, like in a real classroom setting, if he asked a question and he looked up at the class, he could see the students are saying yes or no. They just shake their heads. That doesn't work here.

Dr. B used many other strategies. Some of them worked, and some did not. Students still ranked their level of satisfaction high at the end of the semester. Some of them wished they had been in a face-to-face environment.

Course III

The statistics teacher, Dr. S, knew she had to adjust her teaching strategies in order to teach her distance class. She had taught the same course before in a face-to-face setting. Dr. S devised a number of strategies she thought would be helpful in a distance class. The following are techniques Dr. S implemented to promote interaction and overcome distance.

Writing on the screen. Initially, Dr. S planned to do a lot of writing during her lectures. She created many slides with only a few words or a headline and the rest of the page blank. Although it was awkward to talk and write using the electronic pen, she intended to become proficient with it. When the course started, Dr. S found quickly that writing on the screen was different from writing on the blackboard. To draw lines, for instance, she had to wait for the time lag of sending electronic data. This prevented the instructor and the students from experiencing instantaneous communication as they would when writing on a blackboard in a face-to-face situation. After a few trials of writing out formula in the blank area, Dr. S gave up writing on the computer screen, and prepared her lecture slides with all the words and equations already typed.

Encouraging students to talk. In her teaching, Dr. S valued verbal and nonverbal feedback from the students: "They didn't have to speak up. They could have made some faces, joked a little bit, or nodded their heads." Foreseeing that she would not have these types of responses in a distance course, she explicitly asked the students to express their feelings: "Tell me what you think. Tell me if I am going too fast or too slow." When the class started, however, most of the students did not respond to her, no matter how much she asked. According to the students, most of them knew Dr. S welcomed their questions, and they had no difficulty talking into the microphone. Their problems concerned not whether to ask a question, but when and how to ask: "Without the visual cues, you're playing more of a guessing game as to when is the appropriate time to break in or ask." One student pointed out, "You just have more of a tendency to just let it go on and on. Whereas, if she were there in person, I think you're more apt to break in."

Telephone trees. Having the students exchange phone numbers was another way Dr. S encouraged students to interact with one another. She was aware that the students were not all at the same site and that they had limited opportunity to communicate. Dr. S paid special attention to getting students at different locations to talk to each other. Based on past experience, Dr. S believed that students would be more inclined to call each other if they did so outside of class. Dr. S wanted to establish a telephone tree, or as she called it "telephone buddies," in the class. This did not work, however. Students did not want to pay for long-distance phone calls for potentially prolonged questions about homework and exercises. They simply discussed problems with their classmates at their respective sites on class night. Despite the fact that the instructor tried to bring the class together, no sense of a class as a whole ever occurred. Students related and interacted almost exclusively with others at their respective sites.

Interpreting the Problems

Using teleconferencing in distance education presents an environment that is familiar but also not familiar to teachers who are used to a face-to-face situation. In cases studied, the technology used was visible but also invisible to the participants. Although plenty of machines were in the room, the technology was intended to be relatively transparent and trouble-free, so that the teaching and learning processes could take place without anyone focusing on the medium.

What actually occurred in the classes, however, was something else. The instructors and the students found that the medium made teaching and learning awkward. The technology was more than just a passive transmission medium, it actively affected interaction. Asking questions using the microphone, for example, was not the same as talking face-to-face. This problem occurred in all three classes studied. When talking to the teacher, no student seemed to have a problem speaking at the right angle into the microphone box, but they did have problems communicating. The problems that occurred were not with the machines themselves, but with the machines-in-use. It was not with the speaker or microphone per se, but with the integration of the technology into the act of speaking.

Examining this further, we know that when asking a question, for instance, there needs to be a mutual agreement about when and how a question can be asked. One needs cues such as a nodding head, an inquisitive look, an inviting gesture, or a pause between sentences. These cues are as essential to the communication process as the medium that transmits the voice. These elements are what Brown and Duguid (1993) would call "borders."

The Border Issues

According to Brown and Duguid (1993), the development of a community of technology users produces an array of peripheral elements—"the borders" that surround the technology being used. Brown and Duguid give many examples from daily life where the border elements help define the meanings in a situation. In the case of an encyclopedia, for example, the degree of accuracy and authority of its information is signaled in part by the hefty hard cover of the volume that is expensive for publishers to reproduce. When encyclopedias are produced electronically, on the World Wide Web for instance, the digital forms do not carry the same cues to accuracy and authority as the hard covers. This affects how a person uses the information.

Similar experiences were observed in the distance classes studied. In a distance setting, many previously used border elements that have supported effective face-to-face communication are no longer available. Participants may not notice exactly what is missing, but they may experience difficulty in carrying out or interpreting particular acts of communication.

In the case of question-answering activities, for example, teachers and students a rely on border elements such as body language to interpret each other in a face-to-face class. In the distance classes studied, when visual cues were no longer available, students became quite sensitive to what the teacher said and interpreted the words with known elements such as tone of the voice, length of a pause, and the actions taken right after the words were spoken. In all three classes, and especially in the education and agriculture courses, students assessed the appropriateness of their answers, the "okay or not" responses from the teacher and the reactions of their classmates using available, known elements.

Sometimes, the students focused on border elements that conveyed a meaning different from the words because those elements were weighted more in the students' minds. One of the female students in the education course, for instance, did not believe the instructor's praising words "It's a good job," but instead believed what the instructor's tone of the voice seemed to her to imply, a negative appraisal of her work, "God, is she stupid!" Students at one site in the statistics course felt that their classmates at the other site did not like them because of the way the other students responded. This affected interaction between students at the two sites. Especially when there are few known and available elements for a given context, the meaning that gets transmitted by speaking is powerfully affected. In cases where the border elements are absent or unknown, as seen in the stories, a joke can be taken as an offensive attack, and a suggestive remark can be interpreted as an imposing order.

Border elements are embedded in the context of the situation, and they are usually not recognized until one is engaged in the situation and has learned how they operate. When the new instructors were introduced to the distance learning environment and practiced technology by themselves, they did not realize what the process of teaching with it would be like. It was not until they began teaching with the technology that they discovered how the technology affected their teaching process. It is not surprising that Dr. S invited students' feedback by saying, "Ask me questions at anytime," or by saying "Feel free to interrupt me." Distance students found it difficult to comply. Since these comments are often used in a face-to-face setting, they sounded perfectly normal to the students. In the teleconferencing classrooms, however, some of the expected border elements were missing. The students and teachers did not have border elements appropriate for teaching and learning using distance technology enabling them to understand and convey the same meanings they could transmit in a face-to-face setting.

The problems of communicating teachers and students have encountered at a distance focuses our attention on the composition of everyday classroom communication practice in which a complex set of border elements are used. These surround the seemingly simple classroom action of raising a hand to ask a question, for example. Studying the teaching-learning process in a distance education setting, strongly suggests that we consider how to construct and use new border elements that embrace the new teaching-learning settings.

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Using a Materials Database System as the Backbone for a Certified Quality System (AS/NZS ISO 9001:1994) for a Distance Education Centre

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Distance Education Centre, University of Southern Queensland

Background

The University of Southern Queensland (USQ) has been actively involved in distance education since 1977. In the past 20 years, USQ has come to be recognized, both nationally and internationally, as a leading provider of distance education. The Distance Education Centre (DEC) of the USQ houses a state-of-the-art infrastructure for flexible delivery technologies. The DEC has developed a unique materials database system which is used to monitor pre-production, design and development, production and post-production planning, scheduling, and distribution of all types of materials including courses offered only on the internet. In December 1997, the DEC quality system was certified as meeting the requirements of the international standard AS/NZS ISO 9001:1994. Over 19,000 students are serviced by the DEC in 30 countries.

Introduction

The aim of the paper is to provide readers with a clear understanding of both the elements of the materials database and its integration with a certified quality system (AS/NZS ISO 9001:1994). The paper is of relevance to practitioners wishing to improve management systems related to distance education. The objectives of the paper are to:

- demonstrate the design of a quality system that adapts the ISO 9001 standards to distance education in a higher education institution;
- evaluate the scope and objectives of a Distance Education Centre materials database system for the planning, scheduling, production and preparation of all types of materials;
- identify the different requirements and outcomes for the four main areas of pre-production, design and development, production and post-production; and
- identify the principal elements of integration of a sophisticated materials database system with the ISO 9001 standards.

The materials database system and the quality system have been developed specifically around the roles and functions of the USQ distance education centre. Discussion will focus on an evaluation of the integration of the systems and provide an indication of the successes and failures of both systems.

Quality System

Description

The DEC quality system is a management system which enables the centre, through documented processes, checks and reviews, to improve administrative efficiency, to operate an efficient and effective production system, and to meet customer needs and expectations. Monitoring the DEC performance for continuous improvement is an intrinsic part of the quality system. To facilitate continuous improvement, DEC has implemented systems to incorporate improvement requests, internal audits, document reviews and procedural reviews. The documented system describes the policies, processes and procedures of planning, controlling and verification whereby the stated DEC Quality Policy is implemented. The system produces records that provide objective evidence of conformance to the requirements of a system designed to meet client needs and expectations.

The DEC Quality System documentation consists of:

- the Executive Manuals (Quality Manual, Documentation Manual, Documentation Maps and the Audit Manual);
- Operations Procedures Manuals;
- Forms Manual; and
- Quality Records.

The system is accessible using electronic files that appear on each staff members' computer desktop. The goal is to have available to all staff the latest controlled version without the time consuming version control of a paper-based system.

Materials Database

Description

The DEC Materials Database system has been developed in-house using Cognos Power House Client software to facilitate the planning, scheduling, production, dispatch and costing of all types of materials produced within DEC. In 1997, DEC was responsible for the production of the following:

- 2250 print pieces
- 50,061,519 print impressions
- 69,319 audio tapes: 23,847 telephone tutorial tapes; 41,566 unit tapes; 3906 other tapes
- 59 video productions
- 739 video dubs from productions
- 2142 video tapes
- 720 off-air recordings
- 11 CD productions
- 550 CDs in-house and 4000 produced by external production houses
- 43 www units for courses

The system has been divided into the following main functional areas:

- **System Administration** involves management of the security and activity monitoring systems.

- **Pre-production** includes a collection and planning phase for the proposed course and unit information and production schedule information.

- **Design and Development** involves the design of a blueprint for study materials, copyright procedures and work requests for the production of print and non-print material.

- **Production** includes scheduling and monitoring of the production of all types of materials (eg print, electronic, multimedia), management of material production numbers versus student quotas, and management of the reproduction of materials.

- **Printery** includes the monitoring of materials produced by the USQ printery.

- **Post-production** involves monitoring the dispatch of materials, costing of materials produced and inventory control.

Planning, Scheduling and Production

The database is essential for planning, scheduling and production.

Planning. In the pre-production phase, the database is used to collect information pertaining to unit offerings, the study materials required and the delivery methods using an instructional blueprint. The information is used by DEC sections to plan resource requirements for the production periods. In the post-production phase, the database is used to draw on historical information for statistical and trend analysis purposes.

Scheduling. The database contains due dates for the production, printing and dispatch of study materials. The database is also used for workload allocation for Instructional Designers and Materials Development Clerks.

Production. The database is used by staff to monitor the entire production process from receiving the material from the Faculties, through various production stages and quality checks, and finally through to dispatch.

The Relationship Between the Quality System and the Materials Database

The relationship between the Quality System and the Materials Database can be considered across the areas of pre-production, design and development, production and post-production. The applicable elements of the ISO standards are shown in brackets below.

In general terms, the Materials Database is used to monitor (Product Identification and Traceability), control (Process Control) and verify (Inspection and Test Status) study materials throughout the various phases of pre-production, design and development, production and post-production. Therefore the function of the Materials Database is closely integrated with several elements of the quality system.

To further illustrate this, the Materials Database features in the following DEC Quality System procedures documents where MAN stands for Management; D&D is Design and

Development, EPS is the Electronic Publishing Services and DIS stands for Distribution Services:

- MAN 1.4.1—USQ Bookshop
- MAN 1.7.1—Materials Database Administration
- D&D 2.1.1—Design and Development Process
- D&D 2.1.2—Audiotape Production Process
- D&D 2.1.3—Videotape Production Process
- D&D 2.2—Unit Specifications
- D&D 2.3—Pre-production
- EPS 5.1.1—Booking In
- EPS 5.1.2—Production
- EPS 5.1.3—Proofing
- EPS 5.1.4—Printery Preparation
- EPS 5.2—Examinations
- DIS 6.4—Stock Control

Integration of the Database With the ISO Standards

The major functions of the Materials Database that are integrated with the elements of the ISO Standards are described with examples as follows:

- **4.8—Product Identification and Traceability.** To establish and maintain documented procedures for identifying the product by suitable means from receipt and during all stages of production and delivery (Joint Technical Committee QR/8, Quality Systems, p. 6).

  For example each individual piece of study material is coded, based on the unit number, which can then be tracked through all the various stages of pre-production, design and development, production and post-production.

- **4.9—Process Control.** To identify and plan the production processes that directly affect quality and shall ensure that these processes are carried out under controlled conditions (Joint Technical Committee QR/8, Quality Systems, p. 6).

  For example as each individual piece progresses through the various production processes, including proofing and quality checks, piece status and benchmark dates must be recorded on the database before the piece can progress to the next stage.

- **4.12—Inspection and Test Status.** The inspection and test status of product shall be identified by suitable means, which indicate the conformance or non-conformance of product with regard to inspection and tests performed (Joint Technical Committee QR/8, Quality Systems, p. 12).

  For example each individual piece has a recorded status. Some examples include "prod": the piece is in production; "proof": the piece is at the proofing stage; "final"; the piece has been proofed and is ready for printery preparation.

Other database areas integrated within the ISO Standards are included as examples using the standards numbering system:

- **4.2.3—Quality Planning.** The supplier shall (provide) . . . identification of suitable verification at appropriate stages in the realisation of product (Joint Technical Committee QR/8, Quality Systems, p. 3).

  For example, the monitoring of each individual piece allows staff to ascertain which stage it is at, what the status of the piece is, and whether it has passed the proofing stages and quality checks.

- **4.4.7—Design Verification.** At appropriate stages of design, design verification shall be performed and recorded to ensure that the design stage output meets the design stage input requirements (Joint Technical Committee QR/8, Quality Systems, p. 4).

  For example, when a new or major change piece is submitted into DEC, design verification is recorded on the Materials Database by the Instructional Designer (activity monitoring as input date verified) before it progresses to the production stages;

- **4.13—Control of Non-conforming Product.** To establish and maintain documented procedures to ensure that product that does not conform to specified requirements is prevented from unintended use (Joint Technical Committee QR/8, Quality Systems, p. 8).

  For example, the system prevents any print materials from undergoing printery preparation until the materials have passed the proofing stages and have been signed out on the database by the Materials Development Clerks.

- **4.16—Control of Quality Records.** All quality records shall be legible and shall be stored and retained in such a way that they are readily retrievable (Joint Technical Committee QR/8, Quality Systems, p. 9).

  For example, staff have access to the information contained in the Materials Database including production stages, piece status, inspection/testing status and activity tracking. Staff are also able to run enquiries and reports from the system.

Successes and Failures in Developing the Systems

In developing both the quality system and the materials database systems, there have been both successes and failures.

The Quality System

The initial decision to develop a quality system was made in order to gain an advantage when tendering for external business contracts involving customised staff development courses. Other reasons for seeking certification included improving administrative efficiency; reducing operational failures and consequential rework; cutting the costs of failures and increasing credibility in the marketplace. Quality certification is an incentive to international students to enrol in USQ courses, which provides an opportunity for USQ to increase market share particularly in Asia.

The quality system is very "user-friendly." The success of the system is based on a greatly enhanced working knowledge and high acceptance of system processes by DEC staff. In the certification document, the senior auditor stated:

> Overall the Quality System shows compliance as evidenced by various records viewed. The level of quality system knowledge demonstrated by staff was extremely impressive. As the system has been documented to fit around the processes and practices of the business, it demonstrates a sound approach to quality management. The system will ultimately serve as an effective tool to help achieve continuous improvement. (Sci-Qual International, p. 3)

Apart from controlling the processes that affect the quality of DEC products/services, the quality system is also designed to identify procedural areas for improvement using various continuous improvement mechanisms such as Improvement Requests, internal audits and document/procedure reviews. This ensures the success of the system. For example, the use of Improvement Requests has led to improvements in the tracking, testing and verification of study materials produced by DEC as well as reducing wastage and associated costs. To date the quality system has not "failed" in any way as staff fully support the system and participate in its improvement.

Materials Database

The primary purpose of the Materials Database system is to provide a central data repository of all materials produced and despatched within DEC (ie print, electronic and multimedia). It provides a monitoring system which tracks the production of the materials from the pre-production (planning) process through to the dispatch and costing processes.

The initial decision to develop the Materials Database arose from the need for better management and control of the processes involved in producing study materials. Previously, most processes and records were maintained manually. The system was also developed to provide an integrated and comprehensive overview of the entire process, whereas the previous records concentrated only on specific areas.

Once targeted stages of the materials Database were implemented, the system provided more control over the processes involved in the production of print materials. As a result of this success, the system was expanded to include the processing of other types of materials (eg. electronic media).

Another success of the Materials Database has been the availability of management information of the entire production process. Reports that are streamed from the system have been designed to provide timely and accurate information that can be used for planning, monitoring and decision making.

Similarly with the quality system, the success or failure of the Materials Database depends largely on the commitment of the staff who use it. The information extracted from the database is only as good as the data that is put in—therefore data integrity is vitally important. Also, if staff are unwilling to accept the use of the database, then they can potentially slow the development of the system. Problems have been experienced in these areas.

Since the implementation of the Materials Database, numerous system enhancements have been made in order to meet the changing needs and requirements of staff and the associated processes. Improvements have been made as a result of staff members realizing the potential of the system and the benefits that can be gained from its use and further development.

Future Developments

Plans for the Quality System

The quality system will:

- continue to act as a catalyst to improve DEC procedures and processes and therefore improve the quality of DEC products/services;
- continue to be integrated with the procedures and processes relating to the materials database so that the systems compliment each other; and
- be reviewed in its entirety on a yearly basis to ensure that the needs and goals of DEC are achieved.

Plans for the Materials Database

The goals are:

- to extend the monitoring of processes involved in the design of study materials;
- to expand the tracking of processes required for the production of electronic and multimedia materials;
- to develop an inventory control system covering all materials produced; and
- to develop an effective reporting and query environment covering all levels of reporting requirements that will compliment and enhance the existing reporting system.

Conclusion

The USQ has invested considerable time and money in developing both the Quality and Materials Database systems. A recent University review commented on the improved productivity of the Distance Education Centre, which can be attributed to the integration of both systems. As a result, the expectations of clients, students, staff and management are being met in most instances.

The conference presentation will include examples of some of the detail of both systems. The author wishes to acknowledge the input of Peter Munster, Management Systems Officer, DEC, USQ, who provided the background information for the paper.

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Autobiographical Sketch

Dr. Norm Hughes is a highly experienced post-secondary education academic and administrator. During the past 24 years, he has held positions as: Associate Dean, and Head of Programme, in the Faculty of Education at the Darling Downs Institute of Advanced Education; Director of Administration of the University College of Southern Queensland; Director, Special Projects involving continuous improvement programs at the University of Southern Queensland (USQ) and currently Associate Director (Operations) of the Distance Education Centre at the USQ. His PhD studies included a dissertation entitled "Total Quality Management: the Application of Information Technology" (1993) which included institutions in Australia and the USA including the University of Wisconsin (Madison).

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Development and Assessment of Web Courses That Use Streaming Audio and Video Technologies

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Introduction

Iowa State University, through a program called Project BIO, has been using RealAudio™ technology for about two years in college biology courses that are offered entirely via the World Wide Web. RealAudio™ is a type of streaming media technology that can be used to deliver audio content via the Internet. Streaming media technology can also be used to deliver a variety of other media types (video, animation, text and static images) via the Internet. Using this technology, media files are broken into packets on the server side and streamed over the Internet. On the client or user side, the packets are reassembled on the fly and played using a "plug-in" or helper application for a Web browser. The practical effect is that the media content can be heard or viewed almost instantaneously by the user and the amount of content that can be delivered is virtually unlimited. The technology can be used in either an on-demand mode or a broadcast mode. The delivery of Web pages can be synchronized (automatically or manually) with the streaming media. RealAudio™ is a product of RealNetworks™ (http://www.real.com) the leading software company in this area.

Project BIO (Biology Instructional Outreach) is a multifaceted outreach project with the vision of developing and sharing biology education resources via the Internet. A major objective of Project BIO is to develop and teach on-line biology courses via the World Wide Web. The program has grown from two on-line courses offered during fall semester 1996 to ten on-line courses (8 biology plus 2 economics) that will be offered during fall semester 1998 (Table 1). Most of the courses have been adapted from existing Iowa State University courses that are also offered in a traditional face-to-face format. Project BIO is a national leader in developing on-line biology courses. The Project BIO courses account for about 20% of the on-line biology courses offered in the United States.[1] Project BIO on-line courses were among the first to utilized streaming media technology (i.e. RealAudio) for instruction.

Instructional Design

The on-line courses support multiple learning styles. Students learn by 1) seeing and hearing information presented in on-line lectures, 2) doing active learning assignments and 3) reading material in on-line resources or in the required textbook. The on-line lectures are modeled after a face-to-face lecture experience. Students listen to the instructor using RealAudio™ technology and view a series of slides containing bullet points, diagrams, photographs and other visual aids with a Web browser. The active learning assignments provide lab-like experiences, teach students to find and process information on the World

Wide Web, foster interaction/collaboration among students and reinforce concepts presented in the lectures.

Table 1. Project BIO On-Line Courses—Fall Semester 1998

Introductory biology courses for majors	Advanced undergraduate and graduate courses
Audience: On-campus ISU students, high school students Biol 201: Principles of Biology I Biol 202: Principles of Biology II	Audience: High school and community college teachers, farmers, agribusiness professionals, health science professionals MIPM 302: Biology of Microorganisms Gen 308/508: Biotechnology in Agriculture, Food and Human Health MIPM 501X: Advanced Microbiology
Introductory biology courses for non-majors	Introductory economics courses
Audience: On-campus ISU students, high school students Biol 109: Introductory Biology Biol 123: Environmental Biology Zool 155: Human Physiology and Anatomy	Audience: On-campus ISU students, high school students Econ 101: Principles of Microeconomics Econ 102: Principles of Macroeconomics

Students access course materials using standard Internet technologies (Web browser and RealPlayer). RealPlayer software is used to access the audio portion of the lectures. The Web browser and RealPlayer software are available at no charge to students and are compatible with Mac, PC or UNIX systems. The bandwidth requirement for hearing and viewing the on-line lectures is modest (14.4 Kbps).

We are using ClassNet software to support student/student and student/instructor interaction via the Internet. This software supports three types of text-based communication. Two types are asynchronous (email and a discussion forum or bulletin board) and the other type is synchronous (chat). We are in the process of evaluating several types of advanced communications technologies. Some desirable features are audio communication, white board and browser following.

Assessment of student performance is based on periodic examinations during the courses and on the quality of work in the active learning assignments. Testing is done on-line using ClassNet software. Proctors are used to verify student identity and to monitor student conduct during the exams. The proctor must enter a special password before the student can access the on-line exam.

Production of On-Line Lectures

We have established a facility called the Digital Distance Education Resource Center to support on-line course development efforts. This facility has a server as well as server software for delivering Web and streaming media content. The facility also has two recording studios with all the necessary technology for recording, digitizing, editing and formatting audio and video content. Finally the facility has four computers for general purpose Web authoring.

The Resource Center also has personnel to provide training, technical support and assistance with Web course development. In our approach, the instructor provides lecture outlines, visual aids and records the lectures. Undergraduate Assistants employed by the Resource Center perform the routine aspects of lecture production (e.g. converting the lecture outlines and visual aids to Web-based slides, editing audio files and formatting them for delivery via the Internet).

Enrollment and Audiences for Project BIO On-Line Courses

Enrollment in Project BIO on-line courses has grown from 29 students in Fall semester 1996 to 285 students in Spring semester 1998 (Table 2). Approximately 700 students have taken our courses through Spring semester 1998.

Table 2. Growth of the Project BIO On-Line Course Program

			Location of Students			
				Off-Campus		
Semester	Number of Courses	Number of Faculty	On-Campus	High School	Non-Traditional•	Totals
Fall 1996	2	2	9	0	20	29
Spring	4	4	60	71	14	145
Fall 1997	6	5	134	63	18	215
Spring	6	7	198	60	27	285
Fall 1998	10	8	—	—	—	—
Totals			401	194	79	674

•This group includes high school and community college biology teachers, agriculture and agribusiness professionals, health care professionals, government employees.

The on-line college courses developed through Project BIO serve three types of audiences: 1) high school juniors and seniors, 2) non-traditional students, and 3) on-campus ISU students (Tables 1 and 2).

High school juniors and seniors represent the major off-campus audience for our on-line courses. They are primarily taking introductory level courses although a few have taken advanced level undergraduate courses as well. Many of these students are from rural high schools that lack resources or sufficient student numbers to offer advanced courses for their brightest and best students. As an example only 1/3 of Iowa high schools offer advanced placement biology courses. Students in our on-line courses are able to "attend class" during a free period at school or at home in the evenings. Additionally there is no minimum class size at a particular location.

Non-traditional students include high school and community college teachers, farmers, agribusiness employees, health care professionals, and government employees. Many of these individuals are place-bound and have schedule restrictions because of work and/or family that limit their access to college courses.

Surprisingly, the largest audience (60%) for the Project BIO on-line courses has been on-campus Iowa State University students. They have taken introductory level courses as well as courses at the advanced undergraduate or graduate level. In most cases they are taking the on-line courses instead of a comparable section of the course offered in a traditional face-to-face classroom setting. The attraction of these courses for this audience seems to be: the flexible scheduling which allows students to more easily fit these courses into their schedules, the ability for a student to work at his or her own pace, and the novelty of taking a course via the World Wide Web.

Assessment of the Courses

As with any technological advance, pedagogical questions surround its use in the classroom. In this case, the classroom has been replaced by an asynchronous, individual learning environment. While there appears to be anecdotal evidence that this type of instruction does not negatively affect the learning environment for the students, solid research was needed to substantiate these claims. Two separate approaches to this problem have been undertaken. The first approach was an in-depth analysis of the learning environment and its effects on students enrolled in the WWW section of Zoology 155. In order to provide a rich, thick description of this phenomenon, qualitative methods were used (Merriam 1988, Lincoln and Guba 1985). Three students were chosen from the Fall 1997 semester, and their experience as they traveled through the course was documented. These students were hand selected: one student was a close match to the "average" student in the traditional lecture; one was chosen from the adult student population, and the final case was a student identified as "at risk" by the University. Using data collected from journals, e-mail correspondence and formal interviews, the lived experience of these students was recorded (Greene 1973). While generalization is not a goal of qualitative research, certain themes did emerge with consistency across all three students. These included:

- The technology is problematic for some, particularly females. Confidence in the technology and in the user is important to a positive experience with the Web-class. Two of the cases followed were female (C1 and C3). They both indicated many times that they were less than confident of their computing skills. "The stuff is really interesting. I enjoyed it, but felt I was dealing more with the technology . . . will it work?" (C3) "Today was a disaster! It took me an hour to figure out how to register on ClassNet. Talk about vague directions." (C1)

- Instructor availability is important to all students regardless of their level of comfort with the technology. "I don't e-mail other professors. I got to know you better through e-mail—forced to talk." (C1)

- Attitude toward the subject does not seem to be effected by this medium. In fact, students who scored low on exams still rated the class as "excellent" or "better than most" "Even with the test score I still think this is a neat way to take a college class." (C2)

- Enthusiasm is high at the outset of the semester, and with nurturing can be kept high throughout the term. "I was excited to begin. The freedom excites me. I can do it at 3 AM if I want. This is the height of customer service. The best thing college can do for you. I'm not trying to keep up with you." (C3)
- Motivation appears to be the single most important factor in predicting success in this medium. "This is a totally personal experience. I was hesitant at first—motivation? This was the first course where you got down and studied. I had my mind made up. It takes a lot of people to change my mind. I was comfortable without classmates. The course is set up to get help if you need it." (C2)

As a follow-up to this study, a quantitative study was conducted in Zoology 155, comparing the traditionally taught section to the Internet section. Two surveys were given to the students on a voluntary basis during the semester. The surveys were designed to measure study habits and attitude toward science. Survey validity and reliability was assured by using previously published surveys. In general, retention rates and final grades were comparable in the two sections, as were student attitudes toward science. While not statistically significant ($a = 0.05$), the grades in the Internet section were slightly higher than those in the traditional section. Study habits were most affected by the use of the Internet. Specifically, zero lectures were skipped by the Internet students, while those in the traditional lectures admitted to missing an average of 6–8 lectures (18–24%) over the course of the semester. Also, lecture notes prepared by the students were used more often in the traditional lecture (60–80% as compared to 0–20%) while those in the WWW section found the textbook and the Internet itself to be most useful. (40–60% for both compared to 0–20% in the traditional section). It is my contention that the slight increase in grades is due to these activities used during studying. Also, the WWW students scored higher on the comprehensive final than those in the traditional class, indicating that retention may be favorably effected by this medium (60% in the traditional section versus 66% in the WWW section). According to Clark (1983), the instructional design, and not the medium, is responsible for learning increases. This data would seem to indicate the medium does have an effect—perhaps, as Reiser (1994) indicates, it is a facilitative effect. The choice of medium opens many avenues of learning that are not available in traditional lectures.

Another quantitative study analyzed relationships between student achievement and the following variables: learning and motivational strategies, learning styles, and selected demographics. It was found that learning styles and student characteristics did not influence achievement. The strategies that correlated best with successful learning achievement over the Internet were the value and self-efficacy motivational strategies, and rehearsal and elaboration learning strategy. Use of any learning or motivational strategy by the student correlated positively with student achievement. The higher the student scored on a general use of motivational and learning strategies, the higher the student's overall achievement in the class. The results of a hierarchical regression analysis showed that use of motivational and learning strategies accounted for more than one third of student achievement.

Conclusions

Project BIO is one of the pioneers in the use of streaming media technology in on-line instruction. Ten Web courses have been developed that serve a variety of audiences both on-campus and at a distance. Initial assessment of the courses indicates that they are successful. Student performances and retention rates are good and student attitudes towards the courses are very favorable. Although our efforts have focused primarily on the development of on-line biology courses, the instructional paradigm appears to be applicable to virtually any discipline as indicated by the growing number of on-line courses that are using streaming media technology.[2] The pedagogical aspects of this type of instruction appear to be on the forefront of constructivist learning with students becoming excited and active participants in their learning.

Notes

1. CASO's Internet University, http://www.caso.com/iu/courses/category/science.html, a comprehensive list of over 2600 Internet courses (4 June, 1998).

2. See the Project BIO (http://project.bio.iastate.edu), RealNetworks (http://www.real.com) and RealEducation (http://www.realeducation.com) Web sites for more information.

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Autobiographical Sketches

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Asynchronous Education: A Blueprint for the Future of Adult Learning

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Background

Lakeland College, located in Sheboygan Wisconsin, currently enrolls about 3,600 students. Of these, almost two-thirds study in our evening degree-completion programs. We began our content rich, high integrity "distance learning" curriculum 20 years ago, literally "taking the college to the student." At the present time we operate ten evening sites around the state.

Through this two decades of experience, we have come to learn a great deal about the needs, wants, and desires of adult learners. We have learned, for instance, that our evening students are *not* looking for easy, short-cut educational programs but, instead, are willing to commit substantial time and energy resources to complete a quality educational experience. On the other hand, we also know that the demands of work, family, and community make the rigidity of onground classes less and less attractive.

Advances in computer and telecommunications technology allowed us to consider "outside the box" opportunities to provide a quality educational product while responding to the increasing time constraints of our students. The idea for Lakeland Online was conceived about two and one-half years ago. We considered a variety of delivery modes which might meet our objectives.

We investigated satellite and land-line delivered inter-active televised courses. We rejected this approach as being too complex and too capital intensive. In addition, this process did not address time-bound and place-bound issues we felt were critical to a new program's success. Students would still need to gather at a particular site at a particular time in order to participate.

We briefly considered video-taped courses, delivered by mail directly to the student's home, as a potential alternative. This process, however, smacked too much of "correspondence study" and completely voided the recognized benefits of student interaction and cooperative learning.

We looked at the Internet and the Web as potential delivery media. At that time and—in our view—even today, the lack of standardization and the complexity of dealing with this incredibly vast communications resource made its use less than attractive. We wanted a simple, consistent, affordable delivery vehicle that met our educational and service requirements.

We discovered the Convene software while looking at potential competitors to our Online initiative. The University of Phoenix, this country's largest and best established provider of distance-delivered education, uses a version of the Convene software and their own computer server. We were not particularly interested in heavily investing in our own hardware and attendant technological competencies. We found, however, that Convene would "lease" the software to us, on a per-student-served basis, and allow us to use their server and technical support personnel.

Because the communication process which is enabled by the Convene software is asynchronous and requires only a modem-equipped PC, it met both our requirements for non-time- and non-place-sensitive delivery. Additionally, it required no capital investment on our part and is paid for on an as-applied basis. Most significantly, however, its structure allowed for high levels of interactivity between the student and instructor and between "learning teams" of students.

We launched Lakeland Online with two trial courses during the summer of 1997. We increased our offering to nine courses in the fall, 20 courses last spring and 30 classes during the current summer semester. We have planned for 34 or 35 courses to be offered during the fall, 1998 term.

Student and faculty reaction to this initiative has been strongly positive. For the most part, faculty have found little difficulty in reinterpreting their onground presentation to the online environment. Students have found the flexibility of class "attendance" to be most attractive. And, the college is well satisfied that the quality of its distance delivered curriculum has remained intact.

Delivery Medium

Introduction

For over 9 years, Convene has provided schools, companies, and training organizations with leading-edge software and service to enable them to deliver their programs electronically at a distance. At the present time, over 35 schools are using Convene, and we are the world's largest provider of on-line education delivery.

Planning and Implementation

Once a school has decided to work with Convene to offer online courses, it needs to evaluate the market and identify a niche that they can service. Simply offering a hodge-podge of courses will not garner the momentum needed to see a program flourish.

The next step is faculty training, and this may well be the most important step. A core group of professors (3–5) should be identified and placed into an "on-line training certificate course." After this 6-week course, they are ready to deliver their own classes on-line. Of this core group, one or two of the best online teachers should be identified to act as trainers for future faculty who wish to teach online. In effect, it's like setting up an in-house training program, where successive waves on online instructors are taught and mentored by their peers. We've found this to be the most effective method for training faculty and also a good way to develop a strong consensus for online teaching. At many schools, a divisive faculty has led to a poorly implemented program.

Last, but not least, the school needs to implement an effective marketing program. That program can include radio, print, TV, Internet, and/or on-campus advertisements. Convene can work with its client schools to develop a strong marketing strategy, or can refer the schools to marketing firms which specialize in this work.

Corporate Partnerships

From a more general point of view, Convene has enjoyed its success largely because it forms strong partnerships with schools, where each organization concentrates on its core competencies. Colleges and universities are good at working with faculty, enrolling students, developing marketing programs and, most importantly, delivering content. Convene is a technology and service firm which specializes in network maintenance, software development, help-desk support, and strategic partnerships with other firms (IBM, Microsoft etc.). Working side-by-side with Convene, clients have been able to create effective online programs in the least amount of time and with the smallest up-front capital investment.

Application

How Does Lakeland Online Work?

Lakeland Online is based on asynchronous, computer-mediated delivery. Since our students are typically working adults with busy lives that make sitting in a classroom difficult, our method has proved quite effective. Students do all of their work offline, and only go online to send and receive materials. This not only increases the convenience, it also has a significant impact in terms of educational benefits for the online learner. Students in an asynchronous learning environment have the time to clearly review and refine their responses. This leads to a greater level of depth, creating higher quality communications between students and their classes. Students are divided into learning groups within each class. Students can interact with each other, the facilitator, and the entire class. In order to promote discussion and impart to our classes a modicum of structure, Lakeland has adopted a model of classroom "meetings."

Lakeland courses are configured so that, in addition to a main meeting, each course has five additional meetings: Syllabus, Lecture, Biography, Discussion and Homework. Faculty may elect to create additional meetings for their classes. Frequently, facilitators choose to divide their students into small project/discussion groups. In larger classes, this helps to focus discussion, as well as to develop team consensus exercises.

At the beginning of each class week, facilitators place instructional information into the various meetings. The Lecture Meeting is used to deliver short, directed "lecturettes." Lecture meetings are "read only" meetings that contain information to focus a student's study of the weeks' materials. Homework assignments are placed in the Homework meeting, where students will receive, discuss and share difficulties. The heart of the online learning model, however, is found in the Discussion meeting. Online learning depends on the fluid, dynamic interchange of ideas between students and facilitator. Instructors will start the discussion topic(s) each week and serve as a discussion mediator, redirecting and focusing the process if it should stray from the learning objective. Small group discussion/consensus groups are an important tool for secondary student exchange.

A typical week for Lakeland Online students starts when they "Connect" and check their meeting notes. A student can expect to spend the week working on readings and homework, just as they would in a traditional onground classroom setting. Students use Convene to participate in classroom discussions, ask questions, and receive feedback from other students and their instructor.

Faculty Development

Faculty interest in participating in Lakeland Online has been quite strong. At the current time, 18 out of 43 full-time on-campus faculty members have been or are current facilitators. We have also involved 14 adjunct faculty members in our program. For the most part, this has been a very successful endeavor for the involved faculty. In order to prepare faculty, Lakeland Online has developed a comprehensive faculty training and support program. This program has three tiers, each of which helps prepare new faculty for the facilitation experience.

All new online faculty participate in a four-week online training session, moderated by Lakeland personnel. This comprehensive training program includes pedagogy, online education methodology and how to most effectively use the Convene delivery vehicle. While this training "meeting" has formal starting and ending dates, the actual training is ongoing. Training formally ends when the new faculty member has submitted an approved Online course syllabus.

The second part of our faculty support system is the implementation of a Mentor Program. Mentors are experienced online facilitators who are paired with new instructors. These mentors advise the new faculty member in the development of their individual classes. When the term starts, mentors are silent observers of their assigned instructor's classroom and are able to assist in the identification and resolution of special teaching challenges before those challenges are able to negatively impact the classroom experience.

The final tier is the Course Evaluation. At the conclusion of each term, all students are required to fill out and submit Course Evaluation Surveys, which include opportunities for them to evaluate the online environment and their online instructor. These student evaluations guide instructors, their mentors, and administrative personnel in identifying problems and arrive at ways to correct and refine the online process.

In addition to this formal faculty program, all online faculty members are joined to an online Lakeland Faculty Lounge. This is an informal way to generate conversation about the online experiences, both concerns and successes.

Challenges

One of the clearest challenges in any online environment is the inability to "see" each other in a physical way. This lack of visual cues and the opportunity to see body language and facial expressions is the most obvious issue. Instructors and students have found ways of dealing with this different learning environment. Use of ASCII characters, as well as "writing the way we speak," helps to bring "emotion" into the online environment.

The way in which we typically deliver our educational information—the standard lecture format—is obviously different in the online environment. Lectures are written and are much shorter than their onground equivalent. Study materials and teaching techniques have also been adapted to a written rather than auditory learning environment, making use of the discussion strengths of the online learning environment.

A major challenges that a typical classroom instructor faces is the lack of active participation. Much time and effort is spent trying to increase the quantity of oral communication. In an online environment, however, all students have an equal opportunity to participate in the discussions, not just the extroverts. Potentially inhibiting and discriminatory factors such as race, handicap, gender, and physical appearance disappear in an online environment, and ideas become the major focus. In an online environment, an increase in both quantity and quality of communication is observed.

Online Versus Onground Study

During our first semester of delivering classes online (Summer, 1997), a study was conducted to evaluate the comparative effectiveness of online vs. onground course delivery techniques. The same instructor taught both an onground and online section of Business Information Processing. Care was taken to ensure that syllabi, tests, assignments, and other instructional materials were as identical as possible. In summary, the study found that there was no statistical difference in the learning outcomes between the onground and online class.

Autobiographical Sketches

After spending 26 years in the printing and publishing industries, primarily in sales and marketing management positions, **Lyle L. Krueger** joined the leadership team of Lakeland College in 1991. At the college, he has been involved in Resource Development, Communications and Marketing efforts, Enrollment Management and currently serves as Vice President for Educational Technology and Director of Lakeland's Online program. He received his MBA degree in 1997 and also serves as an adjunct instructor in Lakeland's Division of Business Administration—both onground and online.

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After working several years as a trader for a mortgage-backed securities firm, **Daniel Burke** joined Convene International in February, 1995. His initial responsibilities involved support functions; specifically customer and technical support for Convene end-users. Within a year, he moved into account management and business development. Since 1996 he has serviced most major accounts for Convene, including Ecunet, UCLA, University of Phoenix, Baker College, and Lakeland. He is currently actively involved in the beta-testing and conversion of Convene's network to a Microsoft platform with open architecture to better service clients.

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Improving Academic Rigor Through Curriculum Redesign

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Opportunities for Improving Academic Rigor

Challenges of Curriculum Redesign

Redesigning course curriculum for online multimedia delivery requires rethinking student behavioral outcomes, pedagogical techniques, and the role of assessment in fostering student learning. Student outcomes must be rethought in relation to the goals of the course and the characteristics of the student population that is being targeted. Pedagogical techniques must be revised to achieve effective student learning through online, independent study, and to take advantage of the didactic potential of multimedia. The role of assessment should be re-examined to maximize the instructional utility of interactive, formative and summative evaluations for fostering fluency with course content.

Theories of Learning and Multimedia Design

Inherent in these processes is the opportunity to increase the academic rigor of traditional course offerings utilizing the principles of mastery and discovery learning. Mastery learning techniques, which are based upon behavioral learning theory, emphasize the acquisition of knowledge through drills and repetitive practice (Binder, 1996). Students perform exercises of increasing difficulty, designed to teach them to understand new concepts, and become fluent in their use. Mastery learning techniques have been shown to be particularly effective in teaching the acquisition and retention of skills-based knowledge (Johnson & Layng, 1992).

Discovery learning, based upon Piagian/constructivist theories of learning, emphasizes the acquisition of knowledge through problem-solving and simulation. Constructivist theories of learning stress the importance of contextual learning, intrinsic motivation, and the individual construction of meaning (Roblyer, Edwards & Havriluk, 1997). Techniques based upon these theories seek to bridge the gap between the acquisition and application of knowledge (Schank, 1995). Rather than being told what concepts and principles they are expected to master, students are instead presented with a task to carry out, and a set of circumstances that requires they learn, through trial and error, what concepts and principles must be applied to achieve the desired outcome. Emphasis is placed upon creating a risk-free environment in which students can try out numerous approaches to a problem situation without experiencing negative consequences from that action (Schank, 1994). An atmosphere of experimentation is fostered so that failure becomes a context for learning, rather than a punitive circumstance to be avoided. Discovery learning approaches are particularly useful for teaching processes that may have multiple acceptable outcomes, or for engendering the extrapolation of knowledge acquired in one context to another set of circumstances (Roblyer, Edwards, & Havriluk, 1997).

The principles of mastery and discovery learning form the basis for the design of effective multimedia learning environments. Through the application of these principles, institutions of higher education may increase the academic rigor of courses formerly taught primarily by lecture or self-paced student manuals (i.e. Keller-plan or correspondence courses). The limitations of these passive forms of instruction, whether delivered in the classroom or via a distance delivery medium, have been well documented (DeNeve & Heppner, 1997; Williams & Brown, 1991; Williams, 1996). Research demonstrating that the single most significant factor accounting for student learning is the amount of time spent in meaningful interaction with course content suggests that the single most effective means by which faculty can increase the academic rigor of their courses is through the development of interactive multimedia-based learning modules, either to replace or supplement other forms of instruction (Van Dusen & Worthen, 1995; Walberg, H. J., et. al., 1994; Worthen, Van Dusen & Sailor, 1994).

Academic Departments and Multimedia Design

The development of these learning modules, however, presents a significant challenge to academic departments where faculty have little prior experience with either multimedia development or instructional design for active learning. Even if a few faculty members have developed familiarity with some of the skills required, and applied them in individual classes, meaningful curricular change will likely not have been affected. Significant curricular changes require a departmental effort, and include a re-examination of the goals and outcomes of a course. Curriculum committees, not individual faculty members, typically hold responsibility for redefining course objectives. Cohesive degree programs depend upon such coordination. This is particularly true of large undergraduate survey courses where multimedia instruction may be expected to have the most impact. The fact that such classes provide the knowledge-base for a large number of upper-level courses further identifies them as appropriate targets for multimedia enhancement. Yet such curricular change cannot happen until the number of faculty with the requisite knowledge of multimedia instructional design reaches a critical mass.

Goals of Curriculum Redesign

Curricular Goals

This was the dilemma faced in our college, when the decision was made to migrate our one-credit-hour, introductory course on library research skills from a self-paced, paper manual to a Web-based, multimedia platform. The LI110 undergraduate course on information literacy is part of the University of Nebraska-Lincoln's Comprehensive Education Program, and is required by most colleges for graduation. In addition, it provides the groundwork for all advanced instruction carried out by subject specialists in cooperation with their liaison departments. Our college's curriculum committee, the Library Instruction Program Group (LIPG), is responsible for the content of the course, yet most of the faculty on this committee lacked exposure to, and experience with, multimedia instruction. Although interested, they were unprepared to take on the challenge of redesigning LI110 for delivery via the Web. Nevertheless, with an enrollment of 3,500 students annually, and recognition that the academic rigor of the course needed to be strengthened, the redesign of this curriculum was made a college priority.

The goals of the redesign effort were to:

- Increase the academic rigor of the course by:
  - clarifying curricular objectives;
  - improving student's mastery and retention of course-related knowledge and skills;
  - strengthening the relevance and motivational quality of exercises;
  - eliminating extraneous content.

- Utilize Web-based multimedia instructional techniques to:
  - make the course more accessible to students;
  - incorporate more active learning strategies;
  - increase student's information literacy skills;
  - improve the efficiency of administering and managing course delivery.

- Respond to criticisms of course content:
  - faculty perceptions that it was not rigorous enough;
  - student feedback that exercises did not adequately prepare them for exams;
  - departmental criticisms that students were not demonstrating transfer of training beyond the course.

Faculty Development Goals

A faculty development approach was adopted by the College to allow wider input to the redesign of the LI110 curriculum, and to foster the acquisition of multimedia instructional design skills by all faculty who chose to be involved in the redesign effort. A three-member team of faculty was formed to oversee the redesign effort. This Research & Development Team for Instructional Technologies (R & D Team) was charged with the dual task of infusing the college's instructional programs with appropriate technologies, and simultaneously developing the instructional technology skills of other faculty within the college. The process the Team developed for fostering faculty development and curricular redesign may be adopted by other academic departments to address similar needs of enhancing faculty skills and increasing academic rigor.

Several areas of faculty development were targeted through the redesign effort:

- Multimedia instructional paradigms and methods
- Principles of mastery and discovery learning
- Content analysis and formulating behavioral outcomes
- Formative and summative assessment strategies
- Flowcharting, screen design and storyboarding techniques

A series of faculty development workshops were sponsored by the team, both at the outset of the redesign project, and at strategic points throughout. Some workshops were developed in collaboration with knowledgeable faculty leaders in multimedia instructional design from other departments. In addition, a structured process was used to guide faculty through the steps of the redesign effort from identifying behavioral outcomes and conducting a content analysis, through specifying the multimedia components and discovery learning scenarios to be implemented for each unit.

Organizing for Curricular Redesign

The redesign work itself focused initially on two core units of the LI110 course. Two Redesign Groups, each consisting of four faculty members each, were formed to take responsibility for the two units. Each step of the redesign process was introduced in a workshop setting, and one member of the R&D Team met with each of the redesign teams throughout the duration of the project. Implementation of the redesigned curriculum is being carried out with assistance from a graduate research assistant knowledgeable in the tools of web-development. The formative and summative assessment portions of the redesigned course are being implemented using a cutting-edge testing utility developed by a UNL faculty member and being marketed by Wiley Publishers, Inc.

Guiding the Redesign Process

The Theoretical Basis

The first phase of the redesign process focused on providing members of the redesign groups with the theoretical basis for multimedia instructional design. Since the majority of faculty on the Redesign Groups had no prior exposure to multimedia instruction, we knew we would have to provide some stimulus to get our faculty thinking creatively about the possibilities. The R&D Team began by presenting a basic workshop entitled, "What is a Multimedia Learning Environment?" This workshop allowed us to:

- introduce the basic concepts of multimedia instruction;
- begin to build a common language for discussing multimedia design; and
- present examples of how selected aspects of the LI110 curriculum might be more creatively and effectively taught using a multimedia learning environment.

This presentation was followed by two hands-on workshops introducing the theoretical underpinnings of mastery and discovery learning. These workshops were developed and presented in collaboration with faculty members from the departments of psychology and physics, respectively. The workshop on mastery learning focused on behavioral models of learning, and the computer assisted instructional techniques derived from them, which seek to foster fluency by identifying and developing, incrementally, the component skills that make up complex behaviors. The workshop on discovery learning introduced constructivist theories of learning, and the scenario-based, problem-solving approaches to instruction they inspire. We wanted the members of the Redesign Groups to understand the learning theories upon which these two approaches to multimedia instructional design are based. Drawing upon the outside expertise of faculty at UNL who had experimented with the application of these approaches to learning in the design of multimedia instruction lent credibility to the approach we were asking our faculty to take in redesigning LI110.

Putting Theory Into Practice

Theory is not enough. Perhaps naively, the R&D Team thought that after attending these workshops, the Redesign Groups would dive enthusiastically into the redesign of their respective units. When this did not happen, we realized that understanding theory was not enough; our faculty needed a structured process for applying that theory to the redesign of our curriculum. So the R&D Team designed and presented a series of workshop in which we laid out a step-by-step process for taking our existing curriculum and rethinking it for multimedia delivery.

Content analysis. We knew that in order for this redesign effort to result in a more rigorous curriculum, we would have to challenge the members of the redesign groups to reconsider not only the method of instruction, but also the basic goals and objectives of the course. We therefore started with a detailed content analysis workshop in we provided guidelines for restating the goals of each unit in terms of meaningful behavioral outcomes. Building upon theory presented in the mastery learning workshop, we showed how these behavioral outcomes, which represent composite skills, could then be further analyzed into the component skills required to make them manifest. We emphasized that a clear and complete statement of the composite and component skills to be taught by each unit would serve as a guide throughout the design process for what should be covered, and at what level of detail. In doing so, we sought to ensure that the new curriculum would have greater focus, and contain less tangential material.

Formative and summative assessment. Once the Redesign Groups had carried out a detailed content analysis of their respective units, we introduced the conceptual and procedural knowledge required to develop formative and summative assessment instruments for each of the units. We wanted to tie this step as closely as possible to the content analysis in order to emphasize the correspondence between the two. One of the primary weaknesses of the existing curriculum was that the units often presented core concepts that were never assessed. Moreover, the exercises at the end of each unit did not adequately assist students in learning the knowledge and skills that were to be assessed on the final exam. Another limitation was that the existing curriculum provided no opportunities for students to practice the skills we were teaching, and to obtain feedback on their performance without consequence to their grade. The latter is, of course, the hallmark of mastery learning, and without it, students could not be expected to develop the fluency required to achieve a level of learning that would translate into enduring behavioral change.

Content specifications. The final faculty development workshop introduced faculty on the Redesign Groups to the basics of flowcharting, screen design, and storyboarding techniques, so that they could specify how the content of their respective units should be structured and presented. Since the behavioral outcomes of each unit had already been clearly defined, this phase of development consisted of outlining how the conceptual and procedural knowledge required to achieve those outcomes would be presented to students. Where mastery learning techniques were to be employed, this merely required that faculty specify the material to be presented prior to each formative assessment exercise. In addition, we reintroduced the principles of discovery learning, and asked the redesign groups to consider when a constructivist approach to learning might more effectively achieve the goals of the curriculum. In this case, the Redesign Groups were asked to outline the parameters of the problem-solving scenarios with which students would be presented.

Outcomes of the Redesign Effort

Curricular Quality

Throughout the redesign effort, the importance of three things was emphasized:

1. Bearing in mind the behavioral outcomes that defined the goals of the curriculum.
2. Considering the appropriate level of instruction for the population of students who would be taking the course.
3. Using the principles of mastery and discovery learning to design curriculum that would ensure students develop the component and composite skills required to master the behavioral outcomes.

It is evident from a comparison of the content and design of the original and redesigned curriculums, that the multimedia course aims at producing a higher level of understanding and performance among those who take the course, than did the manual-based course. Both the number and complexity of skills supported by the curriculum are increased in the redesigned course. Moreover, the new curriculum supports the development of all necessary component skills required to achieve the stated behavioral outcomes of the course. This was not the case with the original curriculum. In addition, the redesigned curriculum supports a greater variety of cognitive skills. The manual-based course developed students' comprehension and analysis skills only, while the redesigned, multimedia curriculum fosters comprehension and analysis, as well as application, prediction, deduction and problem solving.

Assessment methods also differ between the old and new versions of the course, with multiple choice tests being diversified to include true/false, matching and fill-in-the-blank questions. The effective use of formative assessment in the multimedia version of LI110 is perhaps the most dramatic change from the manual-based curriculum. Formative development of skills was poorly supported in the manual-based curriculum. The manual did not provide the type of feedback required to support mastery of component or composite skills. Moreover, chapter exercises emphasized composite skills, with component skills rarely being assessed. By ensuring an understanding of the theoretical bases of mastery and discovery learning, we enabled faculty to increasing the academic rigor of the course, using multimedia instruction. Since one of the challenges facing distance educators is to demonstrate that learning in a multimedia environment can be as effective as learning through traditional teaching methods, we look forward to the results of an empirical study of LI110 student outcomes, focused on assessing the skills levels of students completing the course.

Faculty Development

We were equally interested in determining whether the faculty development goals of this curriculum redesign effort had been met. A structured interview was conducted with the members of the redesign teams toward the conclusion of the redesign effort, but prior to the implementation of the new curriculum. At this stage, faculty who had participated in the redesign groups expressed good understanding of the individual tasks they had carried out, but some were still having difficulty internalizing the process in a way that would allow them to apply it to other instructional activities. Some faculty were still struggling to master the specialized terminology of instructional design, others wondered whether the order of design tasks might be varied. A few suggestions were offered for simplifying certain design tasks, and strengthening some aspects of the faculty development workshops. While not everyone saw the theoretical presentations on learning theory as equally valuable, most agreed that the structured analysis and design process had resulted in a deeper, more coherent, and well integrated curriculum. All had found the process enjoyable and challenging, and were eager to see their design specifications implemented.

Participants in the redesign process uniformly reinforced the value of the team approach to curriculum design, reporting that it kept creative energy high, and was necessary to ensure that the needs of different learners were addressed in the resulting curriculum. Most faculty indicated they would be willing to engage in this process again; some were eager for the opportunity to develop more fluency with the skills they had learned. A few were already considering opportunities to apply this instructional design process to other aspects of their instructional responsibilities. Even those faculty with years of experience in the classroom reported they had gained valuable theoretical knowledge, increased confidence and patience with curriculum design, and were eager to apply this process to other aspects of their teaching. This evidence suggests that the faculty involved in the redesign project will continue to use what they learn. The R&D Team plans to support additional multimedia development projects in our college in the coming year.

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Autobiographical Sketches

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ATLAS: Cross Atlantic Virtual Mobility

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In the ATLAS session we will tell you how the open and distance learning environment works in a cross Atlantic project with 10 campuses involved. The topics addressed are:

- How to start the ODL course
- Various kinds of distance learning tools used in Atlas
- How to get it done: lessons learned

ATLAS is a three-year project promoting the co-operation between EU and US universities in the field of Engineering and Environment. Five European and five North American research-based engineering schools participate in the project, developing an international student exchange programme and a virtual learning environment. ATLAS is hosted by The University of Wisconsin-Madison (US) and by Helsinki University of Technology (Finland). The other partners are Oklahoma State University, Georgia Institute of Technology, Arizona State University, Michigan Technological University, Delft University of Technology (The Netherlands), University of Sunderland (United Kingdom), Universidad Politecnica de Valencia (Spain), and Technische Universität Wien (Austria). The duration of the project is from September 1996 to July 1999.

ATLAS has been a very satisfying project. All partners have expressed continued interest and satisfaction. The student interest and reaction exceeded expectations, and so have the results of courses and faculty involvement.

The concrete measures of the project include:

- Virtual mobility through the use of open and distance learning (ODL) courses and new technologies
- Across-Atlantic student exchange
- Targeted study packages
- Development of credit transfer systems

The Basic Atlas Principles

The basic principles agreed upon in the beginning of the project were:

- All partners accept course credits from other partners. So far there has not been major problems to accept the credits from other ATLAS universities.

- Modern ITC technologies will be used to facilitate the project management and to make it easier for the students to get ATLAS info. E-mail is frequently used for

ATLAS management, but also to discuss new ideas to develop ATLAS. The Web site is the best and most actual info source and gateway to ATLAS universities.

- Each partner university will be responsible for enrolling students and generating courses for the ATLAS programme.

The Student Exchange

The exchange programme is in full operation, half of the student exchange being realised. The partner institutions have integrated ATLAS exchange into their regular study programmes.

Virtual Atlas Mobility

Due to the 3 distance learning courses realised during the project the new concept of virtual campuses and virtual students has become a reality among the ATLAS universities. Studies in a virtual environment have been made possible through ODL courses utilising new technology, such as news groups, the Internet and video conferencing. The volume of the virtual mobility will increase gradually from 50 learners in 1996–97 to 150 learners in 1998–99. Many challenging problems have been faced:

- How to motivate and educate teachers to become tutors of virtual courses
- How to enrol a virtual student for a course and how to credit virtual courses

Atlas Spin-Off Project in Wisconsin

Due to the ATLAS agreement it was possible to get work placements for 100 students during summer 1997, and a project called the "Finland-Wisconsin Service Sector Internship" was started. Five months later 103 Finnish college students were working for the summer because of the ATLAS program.

Atlas DLI Course Bank—The Atlas Future

In the future, the biggest challenge will be presented by the further development of ODL courses and their integration into the curriculum. The goal is to share interactive, continuous virtual learning environments among the ATLAS campuses. As this is a rapidly growing field, the experiences gained should prove valuable for the whole educational community. The ATLAS partners are interested in creating an ODL Course Bank, in which all the providers of ODL could exchange courses free of tuition fees. Another central aim is the improvement of the means of transatlantic credit transfer, with the intention of removing this obstacle for Euro-American co-operation in higher education.

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A Systems Model Approach to Organizing a Distance Learning Program

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Abstract

Problems and concerns associated with the organization of a distance learning program are well documented (Beaudoin, 1990; Clark, 1993; Cummings, 1995; Cunningham, Farquharson, and Hull, 1991; Dillon and Walsh, 1992; Gehlauf, Shatz, and Frye, 1991; Goodwin, 1993; Moore and Kearsley, 1996; Salisbury and Conner, 1994; Schlosser and Anderson, 1994; Sheritt, 1992). Academic institutions wish to capitalize on the process for a variety of reasons ranging from financial and competitive advantage to enhanced delivery of instructional material. Faculty are utilizing the distance education and learning methodologies with increasing frequency. However, faculty are often anxious about the process or unfamiliar with the dramatic difference in assembling a distance learning educational product over one developed for the traditional classroom. This lack of familiarity often results in low motivation to learn about distance education methodologies. Further, lack of familiarity also leads to misunderstanding of the methodologies and of the realities from an academic as well as an administrative standpoint. The challenges provided by these issues prompted the development of this presentation about use of a systems model approach to organizing a distance education program.

Presentation

The presentation for this conference will include a discussion of Purdue University's Continuing Engineering Education (CEE) experience in producing distance education over the past twenty years. Although dating back to the late 19th century and early 20th century, the discussion will focus on the last decade and include recent distance learning outcomes involving the use of a systems model approach incorporating the areas of expertise necessary to offer a successful distance learning environment. The process used by Purdue's Continuing Engineering Education department evolved over a number of years and certainly did not assume a systems model approach. Nonetheless, what is known as a formal model today has been adopted successfully by the facility. Considerable time has been spent coordinating collaborations between and among departments to make this possible. A variety of disciplines and areas of expertise have been necessary to make a distance learning experience a success. This incorporates the faculty as the content expert, but also includes technical specialists, experts in instructional design and graphic design, webmasters, librarians, support staff, administrators, broadcast producers, directors, engineers, as well as student assistants. The type of experts needed will vary with the course, the institutions, and the method of content delivery but the resulting knowledge of other content masters is a more holistic approach to delivering a course that extends the overall learning potential through a more comprehensive effort.

The proposed presentation will include a discussion of the systems model used to produce a full distance learning course. It will also serve as instructional material for faculty, staff, and administrators wishing to learn more about the organization of distance education and how to put the many components of the systems model in perspective. There will be discussions of techniques commonly found in distance learning environments that can be adapted to extend the scope and functionality of the traditional classroom in incremental ways involving instructional design, pedagogical methodology, evaluation and management followed by a brief interactive case study. The program will conclude with questions and discussion of participants' experience in their use of distance learning methodologies.

The Formalization of Distributed Learning

Educational theories play an important role in understanding the effective use of distance education programs and therefore enhance management's ability to plan effectively when designing distance programs and facilities. Pedagogical, learning, and adult developmental theories have been drawn upon by the theories of distance education as closely related disciplines (Moore, 1972). In his 1972 paper entitled *Learner autonomy: The second dimension of independent learning*, Michael G. Moore expanded the early definitions of distance education pedagogy as

> the family of instructional methods in which the teaching behaviors are executed apart from the learning behaviors, including those that in contiguous teaching would be performed in the learner's presence, so that communication between the learner and the teacher must be facilitated by print, electronic, mechanical, or other devices. (1972, p. 76)

Moore's studies expanded upon the seminal works of Hölmberg (University of Tübingen), Peters (University of Tübingen), and Wedemeyer (University of Wisconsin) integrating concepts promoted by humanistic psychologists such as Abraham Maslow and Carl Rogers (Moore & Kearsley, 1996). Distance education has been viewed as a highly structured learner-centered system. Combined with psychological pedagogy distance education becomes associated with the "theory of transactional distance" (Moore & Kearsley, 1996).

The theory of transactional distance is a holistic, or systems view, of distance education. It is characterized by the growing array of support activities comprising the development of educational programming. At its core is the principle that one instructor can no longer hope to be able to assemble all the technological components of a course single-handedly. In essence, the distance education theorists explain that for a successful distance educational program or course to occur it must be the effort of a team of many content experts. In this developmental process the instructor is one of a number of experts (Moore & Kearsley, 1996). Moreover, in a learner-centered approach the instructor is no longer the focus but instead an expert facilitator of the course content.

Part of the transactional distance (or the psychological separation of course from students) is the greater need for balance between structure and dialogue. Behavioristic in origin, the increased emphasis of learner autonomy was once seen as an annoyance. As a result of more recent research this is beginning to be seen as a cognitive choice by the learner, as well as the instructor, in the form of personal learning and instructional styles (DeNigris, 1996).

Research is demonstrating that the propensity for individuals to interact in a distance program varies. These differences play important roles in the successful use of distance education methodologies as well as in the planning and administration of delivery methods, age, personality and cognitive/learning styles and are important factors (Kearsley, 1995). The level of interaction needed by students may vary depending upon their ability for self-direction or autonomous behavior. Kearsley cites professionals and executives as generally in need of less interaction and children in need of higher levels of interaction (1995).

More recent on the scene of educational technology and distance education are the theories of human-computer interaction as part of the field of human factors specialties. Two researchers stand out in the field of research in the design of technological artefacts. Of the early human factors specialists Donald Broadbent has pioneered the subject of human interaction with 'everyday' things but with extreme views not always well received by his colleagues (Colbourn, 1995). Colbourn (1995) considers Donald Norman's case-study approach less scientifically rigorous "but no less rich in production or information." According to Christopher Colbourn (1995) both researchers represent the opinion growing in support that it is no longer thought humans should adapt to technology but that technology itself must change to better address human needs and functions. While this view is becoming more widely adopted, it is still moving at a slow pace as the emerging research takes time to filter through the actual industry production process of technology products.

Also important today is an understanding of the evolving constructivist theories of mental modeling and analogic thinking, metaphoric/analogic thinking, schema theory knowledge structures, metacognition, metadata, imaging, and the information processing model of cognition. An understanding of current research is as necessary as an understanding of new and evolving technologies to prepare decision makers with the ability to make quick and accurate decisions required for institutions and their workforce in a rapidly changing world.

Looking at the specifics of delivering education at a distance the literature recognizes specific components as necessary for the distance education environment to work effectively and come alive as noted in Table 1.

Although the desired characteristics sought for the traditional classroom instructor are also those for someone teaching at a distance, it takes a creative mix of components to actually draw in the students from a remote, independent environment and make them feel a part of the process and community. Regardless of personal learning style or level of motivation the highest priority of these components is *good communication*. When working at a distance, without communication the rest falls apart.

As a result of research, new technologies, and the rapidly changing face of technology, education, and the workplace,it has become necessary for educators to reconsider how to deliver course content to students. Time alone will not allow learning all the new educational applications and practices, but relying on the expertise of many content experts will help ease the burden of keeping pace with change while still delivering quality education. The old 'factory style' business model of Frederic Taylor's scientific management approach has long since outlived its usefulness in our workplace. Thus, the classroom needs to be updated to reflect changes in society (Oblinger and Maruyama, 1996).

It should still remain the responsibility of the instructor to serve as the content expert. In this role the educator determines the direction of the course while operating as project manager during the development process. Remembering to let the subject matter of the course, not technology, determine course direction is an important issue to consider. A team of other content experts can help during this developmental phase. A team of content experts has been found useful in areas such as technology platform selection, multimedia use, design of graphics, animation, film clips, web development, software programming, pressing compact discs, producing slide presentations.

Table 1. Necessary Components for Effective Distance Education

Good communication:	Clear objectives Regular feedback Close attention to all communication
Technologically astute instructors:	Aware of new coaching/counseling skills to guide independent learning experience and anticipate the need for intervention. Utilize formal or informal systems to free instructor to focus on content and students through use of multiple content experts.
Effective facilitator or team leader:	Coordinate process of group work allowing instructor to focus on content and students.
Comfort in use of planning and organizing skills:	Eases creation of sufficient structure, delivery and flexibility with technologies.
Efficient use of preparation plans and training:	Enhanced through use of continuous professional development programs to keep pace with technological and pedagogical changes.
Flexibility:	To better deal with change and ambiguity.
Experience:	Necessary components for the traditional classroom are also desirable qualifications of distance education instructors: Enthusiasm Genuine concern for student Understanding of subject matter Fairness

(Lawton, Papineau, Ramage, 1996)

Lest you think this approach extremely expensive, consider the numbers of departments involved in each of these areas already housed on most university campuses today. Just as the business community is moving in the direction of more collaborative work environments and team efforts, the foundation to the systems model is already in place in most institutions of higher education. Establishing and nurturing these collaborations is key to the success of the systems model and the focus of this presentation. The strengths and weaknesses, successes and failures of utilizing a loosely-formed systems model by Purdue University's Continuing Engineering Education distance education facility will be discussed.

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Videoconferencing Training Beyond the Keypad: Using the Interactive Potential

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Introduction

Instructional Communications Systems (ICS), an academic support unit for the University of Wisconsin System, has been a leader in teleconferencing for more than thirty years. A unit of one of three University of Wisconsin-Extension divisions, ICS is located on the UW-Madison campus in historic Old Radio Hall. There is a great deal of excitement at Old Radio Hall these days. In just three months, ICS will be moving to its new state-of-the-art facility, the Pyle Center, where it will be able to expand its support work and technology training, and continue to reach out to faculty, government and the private sector statewide, nationally and internationally.

ICS Training and Materials

At ICS, we work with the full spectrum of technologies: audioconferencing, audiographics, videoconferencing and computer assisted learning. Videoconferencing is an area in which ICS personnel have been heavily involved during the past two and a half years, working with clientele at all of the various training levels: 1) orientation, 2) planning and preparation for single meetings and briefings and 3) the more advanced level of multi-session program development and design.

During the course of our training experience, our training team has developed a framework for working with our clientele and for planning our training sessions. The framework is included in the Compressed Video materials we have developed and outlines seven critical areas that are essential to consider when planning to use videoconferencing. We call the framework "7 Keys to Success":

- Understanding Participants
- Knowing the Environment
- Working as a Team Player
- Developing Formats and Strategies
- Creating Interaction Activities
- Integrating Support
- Monitoring for Quality

Interaction

These Keys take training "beyond the keypad" and include all of the areas necessary to consider in videoconferencing: preplanning, development, design, management, assessment and follow-up. At the center of the framework is the use and selection of appropriate interaction.

By its very nature, videoconferencing lends itself to two-way interaction and to the use of visuals. It's potential for interface with a wide variety of other technologies and media expands the interaction capability. Research literature supports the importance of interaction in distance learning. The field of cognitive and perceptual psychology provides a foundation for the significance of interaction in the learning process (Neisser, 1976, Gardner, 1985). Moore (1989) relates interaction to distance learning and outlines three types of interaction that take place in this environment. Gibson (1998) includes, in addition, the medium and learner context. Klivens (1994) and Mantyla and Gividen (1997) relate interaction specifically to videoconferencing and emphasize its significance in videoconferencing design. The significance of interaction in videoconferencing has also been validated by the University of Wisconsin faculty we have worked within our training workshops. We believe that the importance of interaction when using videoconferencing cannot be overemphasized.

There are many types of interaction to draw from. You have most likely used many of them in your face-to-face teaching and will be able to easily add to the activities we have used in our training. Table 1 is an Interactivity Spectrum that sorts the interaction activities into five categories and suggests five activities in each category. These activities vary in form from the very simple (using names, showing objects, Q & A) to those that are much more complex (trigger videos, labs and field trips.) While the Interactivity Spectrum suggests activities that you can choose from, the Interactivity Guide Pyramid (Figure 1) helps you in the selection of the activities that will comprise a "well-balanced" program. Mavis Monson, who created the Pyramid says, "As you select from the Interactivity Guide, keep in mind the total context of the program. Sparingly choose from the Presentation Group (if one-way presentation). Use more generously if mixed with activities from the other groups."

Table 1. Interactivity Spectrum

Present	Personalize	Show	Participate	Question
lecture	name use	objects	readings	Q & A
expert guest(s)	postcards	pictures	fax/e-mail	black box
interviews	bio-form	trigger video	groupwork	debates
case study	bio-booklet	particip. video	field trips	quizzes
storytelling	dialogue	simulation	lab sessions	fish bowl

Note. Activities vary from the very simple to the very complex.

As we work through program development and design with our clients, we encourage them to develop their session content into short 10-15 minute modules that include appropriate interaction activities, well-prepared visuals and complementary print materials. The short modules bring variety to the sessions, the interaction activities engage and involve the participants and the visuals highlight the main points in the print materials.

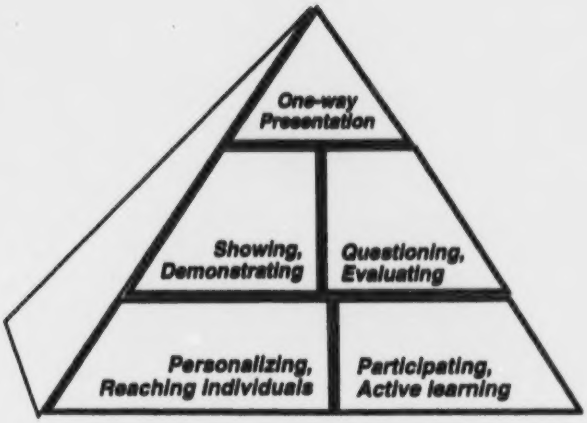
One-way Presentation
Showing, Demonstrating
Questioning, Evaluating
Personalizing, Reaching Individuals
Participating, Active learning

Figure 1. Interactivity Guide Pyramid.

Note. Developed by Mavis Monson, UW-Extension, 1995, based on the Food Guide Pyramid (U.S. Dept. of Ag & U.S. Dept. of Health & Human Services, 1993).

Clients we have worked with have developed some very innovative programs that have engaged and involved their participants in meaningful activities. The Wisconsin Public Service Commission developed seminar sessions to explain new regulations and procedures and to train water utility personnel in their use. A second series of seminars addressed Rates and Accounting Issues and Consumer Issues. In all, nearly 500 participants were involved in this series. Interaction strategies that they used included role play, short presentations, collaboratively filling in sections of forms and Q & A.

Bell Atlantic Learning Labs developed scenarios that focused on training their technical personnel. One of the scenarios simulated checking power lines and outlets for power leaks, another focused on safety in climbing poles and described the proper boots to wear while on the job. A third scenario had the instructor at Bell Labs and participants at the other sites working on the installation of wires in junction boxes. The first two scenarios took place in the "interior neighborhoods" built inside of the Bell Labs training facilities and were followed by Q & A segments. In the third scenario, the junction boxes, wires and wire insertion tool were sent via FedEx to all of the sites. With the help of document cameras at each location, participants were able to practice inserting the wires into the junction boxes and at the same time give the instructor a closeup view so that it was possible for him to evaluate their proficiency. As we continue to work with academia, government and the private sector in videoconferencing, we are moving in the direction of workshops that go "beyond the keypad" and working more closely with program development and design that includes a focus on interaction activities.

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Distance Learning as an Organizational Change Intervention

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Abstract

This paper is a case study of an interactive distance learning project at Nortel to introduce a new integrated product introduction (IPI) process for product developers and project managers. This new process involves changing the current gating product development process to one with cross-functional teams, concurrent engineering and business decision points. The instruction was delivered with a partnership between three functions at Nortel: the Employee and Organization Learning (EOL) group, the Nortel Vision group, and the Public Carrier Networks Integrated Product Introduction group. The analysis of this case includes instructional design recommendations, cost alternatives, technology alternatives, evaluation results and how distance learning can be used to form a corporate community to introduce change in far less time than traditional learning methods. Qualitative interviews were conducted with a sample of 700 participants to determine the learning and their views of interactive distance learning. The results of this case are explained in terms of instructional design theories, Everett Rogers's theory of diffusion of innovations, and complexity theory.

Company Background

Nortel (Northern Telecom) is a global telecommunications company with 78,000 employees worldwide with key locations in Canada, the United States, and the United Kingdom. Telecommunications is rapidly becoming a deregulated, multi-vendor competitive industry, in sharp contrast to the traditional monopoly network model that prevailed during Nortel's first century. Recently the industry has experienced major changes as a result of emerging technologies, deregulation, and global competition. The industry's role has shifted and grown from being a supplier of equipment to being a provider of network solutions to global customers. The company's focus has shifted from a "dialtone" emphasis to one of "webtone" in which providing network solutions for internet service providers (ISPs) and providing the same quality and reliability to the WEB is of paramount importance. To enable the company to shift its focus to webtone, the company must become more agile, with integrated processes and shorter development cycle times. Organizationally, the company must learn to operate comfortably as a complex adaptive system, in a fitness landscape with other, similar complex adaptive systems. The IPI process is one method to reduce time to market in introducing products, and provides support for nonlinear dynamic processes.

Integrated Product Introduction

External and internal benchmarking have long convinced Nortel that a company that gets to the market first with a high-value product is the one that wins. The primary value of Integrated Product Introduction (IPI) is that it is a means to reduce time to market for Nortel network solutions. It helps reduce the uncertainty associated with Nortel's new product introduction process. A governing principle of the IPI project is to implement world known best practices systematically. Best implementation will be done in partnership with accessible practiced leaders, thereby reducing the uncertainty associated with implementing something untested in the context of IPI.

The IPI process is an organizational cultural change to enable Nortel to change product introduction from a serial, hierarchical gating process to one of concurrent engineering, multi-functional teams and business decision points. In addition, risk management and risk mitigation strategies are an essential component of Integrated Product Introduction. The change also recognizes that project management, like other forms of organizational work, is a complex adaptive system, existing as a part of a larger system.

Learning Solutions and the IPI Project

The education for the Integrated Product Introduction process was initially conducted through traveling road shows and a coaching network that was under-resourced. Interactive distance learning was investigated as a solution to reach a wider audience in a more compressed time frame with a goal to develop a community of learners. The goal of the project was to encourage conversion to the IPI process throughout the company, which is an organizational development change intervention.

Partnership With Nortel Vision

Nortel has an existing information systems infrastructure with satellite broadcasting, video and audio conferencing as well as file-server capabilities. The interactive distance learning network is called Nortel Vision. The partnership with Nortel Vision and the Employee and Organization learning functions designed a six-hour IPI overview course. The Nortel Vision network offers a variety of delivery options, including broadcast-quality 45 Mbps capability, 384 Kbps video conferencing access, and satellite-based downlink capability. This ubiquitous network is ideal for multi-site corporate communication or distance learning events.

Design Considerations

Interactivity was a key in the design of the course. This was accomplished with breaks during the course for Q & A as well as a problem-solving activity during the lunch break. The delivery initially was set for eight locations in North America. The methods of interactivity had a direct impact on the cost alternatives.

Cost Alternatives

The two basic cost alternatives that were considered were one-way video (with return audio) and two-way video. Within the two-way video alternative, there were also cost considerations in broadcast quality. Terrestrial-based video systems fall into two categories:

1) Full-motion analog (6 Hz) or digital (45 bps) video or 2) DS1 and n x 64 Kbps videoconferencing.

In terms of two-way video, Nortel has determined that for effective learning to take place in this environment, there is a limit of about 100 people in all the sites for two-way video to be effective. Two-way programs are designed for a high degree of interactivity. The technology limits this method to about eight sites. In terms of costs, the transmission for two-way video is approximately 1.5 times the cost of one way video.

The one-way video (with return audio) is also referred to as "Business TV," and is a solution typically delivered across a fiber or tertiary network such as a T1 or DS-3 network. However, for delivery to multiple sites, it is most often based on satellite technology. This method can reach a wider audience of up to 2000 people for one event. Interactivity can be built in with keypad response systems, phone or fax lines.

The IPI program was announced nearly three months in advance. The response to this topic was overwhelming, with 1500 people calling in during the first week of registration. The final program consisted of 16 sites all over North America with over 500 people participating in the event. The interactivity consisted of a speakerphone at each site and a fax machine. The program ran during one day during September 1997.

Program Evaluation

Level I (Reaction) evaluation forms were distributed at each site. The program achieved an overall satisfaction rating of 3.0/4.0 that is 20% less satisfying than the traditional classroom instruction. There were quite a few comments on the forms indicating the need for a live instructor, in spite of having a local facilitator and technician located at each site. Others indicated the need for deeper learning in the IPI process and not just the overview.

Follow-Up Qualitative Analysis

Data was also collected in a series of telephone interviews from November 1997 through January 1998. Participants for the interviews were selected at random from a pool of people who attended the course. While the original intent of the study was to include input from managers of people who attended, this was not practical. Only one manager was available for interview.

Purposes of the Interviews

These interviews were intended to probe three key areas of interest:

1. To what extent do course participants and managers identify their own work environments with characteristics of complex adaptive systems? The responses establish, in a detailed way, the characterization of the work environment, and descriptions of it.

2. To what extent do participants and managers agree on their understanding of the content of the IPI Introduction course, and its intended Level of Performance? The responses establish the extent of agreement, as far as what the course intended to

cover in its content, and agreement on the level of performance which participants should have when exiting the course, having successfully completed it.

3. To what extent do participants and managers believe that the electronic IPI Introduction course complemented their work situations? The responses establish the extent to which people saw the electronically delivered course as a comfortable fit with their work environment, both in terms of content and delivery method, and the extent to which they believe that the course supported them in their actual work performance. The responses in this area determined the extent to which people saw the electronically-delivered course itself as a complementary complex adaptive system, integrated with the work systems.

Findings

Participant comments indicate that the course content and delivery method did fit into their needs for an overview, although the material was not currently useful on the job. There is a general acceptance for the course, and appreciation of the diversity and ease of use provided by the electronic delivery system. The manager reinforces the effectiveness of business television as a delivery medium, and supports the need for introduction of IPI, but with the sustaining support of management, to ensure ongoing success. From both participants and the manager, the analysis of all responses indicates a positive feeling about the course and its delivery method.

One concern, derived from an overview of the managerial comments, and from the actual interview sessions themselves, is that participants were often at a loss to connect the course with the job. This raises some concern, not especially about this course, but about all courses delivered in the company. Do managers really know enough about the courses, either to recommend them to employees, in a coaching situation, or to evaluate the extent to which a course has had impact on the work situation? The conclusion at this point is that they do not. This means that new initiatives or systems which are introduced through training may need to include managers and supervisors in the training sessions, or in detailed briefings, to ensure the link between their knowledge and ability and their employees' knowledge and skills. If the intent of training is to change behavior and processes, then supervisors need to be well aware of the contents and intentions of training courses used in the development of their employees.

Conclusions

The cost analysis of the IDL broadcast versus flying instructors to different sites shows the costs were about the same. However, in order to implement this overview course with live instructors it would have taken up to three more months for subject matter experts to teach the course at each location. Therefore the savings are found in time to implement an intervention. The literature shows other applications in using IDL as an OD intervention (Stone and Williams, 1996) in implementing a network of 40 organizations developing their strategic objectives.

The feedback on the evaluations and requests for live instructors for these IPI courses do not indicate wide acceptance for IDL in the corporate environment. Further work is needed to develop acceptance for this type of learning innovation. Rogers (1995) says that many innovations require a lengthy period, often many years from the time they are available till they are widely adopted. He explains this process as "diffusion of innovations."

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Autobiographical Sketches

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The Academic Library's Role in Distance Learning Support Services: What Your Library Can Do for You

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In 1992, William Woods University began offering degree-completion programs, and later, graduate programs in an intensive, off-campus cohort setting. The impetus behind this plan was to provide access to higher education for adult students who could not be accommodated by residential programs and schedules offered by traditional universities. To accomplish this goal, William Woods University adopted the cohort model of accelerated learning for the graduate and degree-completion programs. The cohort model allows students in more remote areas of the state to access graduate education. William Woods University provides teachers and materials for each cohort which usually contain around twenty students. Each cohort takes approximately eighteen months to complete. This has proven to be very successful because of the small class sizes and an active learning style tailored to full-time working professionals.

William Woods University has enjoyed a long history of providing quality education. Founded in 1870 as the Female Orphan School, William Woods University became a 2-year college in 1890, a 4-year institution in 1962, and finally a university in 1992. Since the inception of the College of Graduate and Adult Studies in 1992, the graduate division has grown almost 1100% (not a typo) in 5 years, with current enrollment at 785 students. The College of Graduate and Adult Studies (CGAS) began offering cohort classes in Missouri in 1992, with 72 students in 4 cities. This has expanded to 785 students in 16 cities.

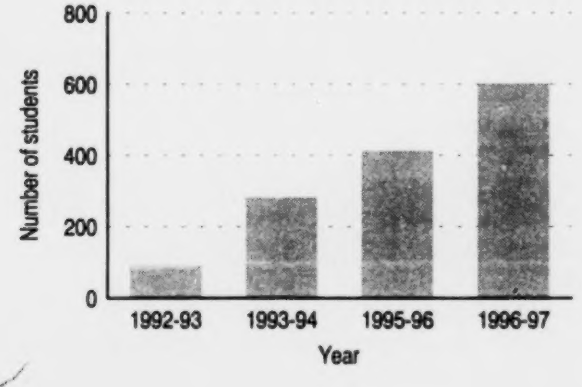

Figure 1. Students enrolled in the College of Graduate and Adult Studies.

In keeping with William Woods University's long tradition of excellence Dulany Library was presented with quite a challenge. Providing excellent library service to on-campus users is challenging enough; providing equal service to students and faculty who rarely, if ever, come to the campus in Fulton, Missouri is another set of challenges. Through much hard work and brainstorming on behalf of the library staff, we have developed several efficient ways to deliver library services, using both innovative technology as well as more traditional methods of information delivery.

Dulany Library strives to provide the best possible services for off-campus students and faculty. This includes providing access to research databases and research assistance to faculty and students, interlibrary loan services, and providing adjunct-faculty course materials.

We are lucky in the State of Missouri because the Governor has made internet access for schools and libraries a priority. Governor Carnahan created the Missouri Research and Education Network (MOREnet) to install an internet infrastructure for the state of Missouri. By 1995, every public library in the state had internet access. William Woods University's access is provided via MOREnet; we can be reasonably certain that most of our students have access to a public library with internet access.

The majority of our off-campus students have some sort of WWW access, either through a private ISP, or a local public library. We have developed a web page specifically tailored for these cohort students. On the web page, we have mounted a variety of publicly and privately held databases and collections of web-based resources. We also offer on-line reference assistance, interlibrary loan and limited technical support.

Dulany Library offers access to fifteen commercial databases to on-campus users. These databases include those purchased by WWU individually and as members of various consortia, including EBSCOhost, PCI, First Search, Cambridge Science Abstracts, and Lexis-Nexis Universe.

One of the major obstacles to providing library services in this manner is the legal restrictions database providers place on library users. Most database manufacturers provide access based on IP address. While this mode of access is seamless for on-campus users, it creates a problem for off-campus users because they access our pages using off-campus IP addresses which the database vendors do not acknowledge as valid. There are several options to address this issue:

- Negotiating with database providers to provide alternative access via login names and passwords. Most database producers prefer the IP address solution because it is lower maintenance for them.
- Provide dial up access via an 800 number to login to the campus server then access library databases using campus IP addresses
- Providing a proxy server to allow users to login to a web page, get access to a WWU IP address and access the databases from there. The library, working closely with Campus Information Systems, has purchased and is planning to implement a proxy server. This software will allow off-campus users to come to our database web page,

login, be assigned a WWU IP, which will allow them access to the research databases Dulany Library has purchased.

In addition, to providing access to the research databases, Dulany library takes seriously the issue of assisting remote students with research for their classes. We offer several options for assistance from a distance. The library provides all graduate students a packet of printed bibliographic instruction materials at the beginning of each cohort. This packet includes instruction for specific databases (ERIC, First Search, EDGAR), general research assistance (Boolean searching techniques, evaluating resources), and policies and procedures for the library.

We also provide online assistance with databases via the web page. We use web pages to demonstrate use of various databases and research concepts. We have designed and linked to web pages that assist students with the research process. In addition to general research skills, we have created web-based tutorials for several of our databases and our online catalog. We also have email links from the web page to a reference librarian, reference question forms and phone numbers for more personal assistance.

Once students have found the citations, Dulany Library offers several options for getting the needed materials. Students can contact us via phone, fax, or email to request materials held by the library be sent to their homes. Items not held by our library are acquired via interlibrary loan and then forwarded to the students. Students are more than welcome to request these items through their public libraries, but we feel we have an obligation to provide as many services as possible for them.

The College of Graduate and Adult Studies also purchases a wide variety of instructor resource materials to accompany the text books used in the cohort courses. These materials include instructor's manuals, test banks, software programs, video cassettes, transparency acetates and slides. All of these items are housed in the library. The Technical Services Librarian catalogues all of these materials and adds them to the library's collection. A comprehensive, annotated list of all instructors' resource materials is distributed to the cohort faculty and is also included on the cohort databases webpage.

The library has developed procedures to send these materials directly to the faculty's homes via the mail, with return postage enclosed. Faculty members can arrange to have items shipped to them by making a phone call or sending e-mail to the library. Prior to the library taking on these responsibilities, CGAS employed a full-time clerical staff member to coordinate the sending and receiving of these materials to the faculty members. Since these types of activities are the provenance of the library, we can take care of these functions without a substantial increase in workload for the library staff.

We have succeeded in making the information about these supplemental materials readily available to the adjunct faculty. They can now be proactive in meeting their informational needs by accessing our online catalog. All supplemental textbook materials are included in the catalog and are searchable by textbook series title, course number and keywords.

We feel that the staff at Dulany Library is doing an excellent job of providing library services considering the size of both the staff at hand and the institution. These ideas may not be applicable in every situation, but the creative problem-solving talent of our staff makes our library a solution for many non-traditional information needs. If you find your institution in a similar situation, rather than re-inventing the wheel, the solution may be as close as your library.

Interpersonal Group Dynamics and Development in Computer Conferencing: The Rest of the Story

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Introduction

In educational literature and practice, more emphasis has been placed on group learning as a source of knowledge building and a way to enhance learning (Jonassen, Davidson, Collins, Campbell, & Haag, 1995). The social and interactive components of computer conferencing now make it possible to use group learning pedagogy in distance education, thereby enhancing the connectivity and socioemotional engagement in the learning process (Harasim, 1990).

However, the three attributes of the majority of computer-mediated communication (asynchronicity, text-based communication, and computer-mediated interaction) "create a unique social climate that impacts interactions and group dynamics online" (Gunawardena, 1995, p. 148). Research suggests that the nature of groups and communication in groups are changed when the affiliation is computer-mediated (Burt, Grady, & McMann, 1994). Recent studies have indicated the importance of examining social factors in computer conferencing and their effect on communication and learning (Gunawardena, 1995; Walther, Anderson, & Park, 1994).

Group Development

In order to use group learning effectively we need a framework for understanding how groups develop. Group development theory, based on face-to-face groups, assumes that groups move through predictable series of changes, or patterns, over time. There are a variety of group development models focusing on varying facets of groups, however many acknowledge the importance of the socioemotional aspects of group development.

Schutz' model of group development. William Schutz's (1958) model of group development served as the basic guiding framework for the study. This theory asserts that there are three basic interpersonal needs: Inclusion, Control, and Affection (which Schutz later incorporated into the broader category of Openness). Schutz views group formation and development as a process in which the participants attempt to satisfy these three basic needs of interaction. These needs are always present but to varying degrees in different individuals and in different phases of group development. They are never completely resolved, but keep resurfacing as predominating themes in a predictable, recurring pattern of Inclusion, Control, Affection.

Lundgren's typology of interpersonal issues. David Lundgren (1977) was interested in developmental phenomena in self-analytical groups. He developed a typology of problem areas in interpersonal relationships for use in content analysis which was derived from a review of literature relating to interpersonal aspects of small group behavior. Inherent in this typology was the assumption that there is an orderly sequence of interpersonal issues in T groups that are reflected in the overt content of interaction among group members (p. 180). His typology involved five major classes of interpersonal issues or problem areas that were similar to Schutz' classifications: Involvement (analogous to Schutz' inclusion), Control, Openness, Solidarity, and Conflict. Openness and Solidarity are included in Schutz' Affection category. Lundgren's typology was adopted for use in the present study.

Purpose of the Study

The purpose of this study was to explore group dynamics and development in a computer-conferenced course. The research was not concerned with the product but with the process of communication, focusing on the social interactions of the participants and the development of the group. Therefore, the emphasis in the present study was on the interpersonal nature of interactions and what they tell us of group development in a computer-conferenced course.

The Research Study

Objectives

The objectives for this study, developed based on the above discussion, evidence in the literature, and personal experience with computer conferencing, were:

- To describe the level (quantity) of participation, intended audience (individual vs group), and the relationship, if any, among and between messages over time;
- To identify and describe the functions of the interactions, as outlined by Henri and Rigault (1996), and determine if the pattern of those functions changed over time;
- To identify and describe the characteristics and patterns of interpersonal interactions over time in computer conferencing; and
- To determine patterns, if any, of group development based on interpersonal needs.

Context

This study examined the group dynamics and development of a graduate-level, computer-mediated course taught in the Fall of 1995 using "FirstClass®" software. The class consisted of 11 females and 8 males ranging in age from 25–50. Only three had participated in computer-mediated courses before and of those none had used a computer conferencing system. After an initial face-to-face meeting to orient students to the course and the conferencing system, all communications were conducted online, almost entirely asynchronously. Live chats, whether serendipitous or planned, were very infrequent and not recorded and therefore not included in this study. After two weeks of getting acquainted with the system and each other online through discussion of course content, the class was divided into three smaller working groups each with their own area for discussions.

Each week students were to read and comment on the week's reading assignment and then participate in the ensuing discussion. Each of the three groups was responsible for posting a summary of the week's discussion to the larger group. There were also periodic assignments for students to write and submit which were included in the discussion topic for the following week.

Methodology

Data for analysis consisted of the computer transcripts of all the messages from three separate weeks (weeks 3, 8, and 13) in each of the three small groups. Data were analyzed within each group over time and across groups over time using a coding scheme based on Lundgren's (1977) typology of interpersonal needs and Henri and Rigault's (1996) content analysis model for analyzing computer transcripts for dimensions of the learning process.

Individual messages are typically too large and complex to be coded as a single unit. The speech segment was chosen as the basic unit of measure for this study, defined by Henri and Rigault (1996) as the smallest unit of delivery that is linked to a single theme, directed at the same interlocutor(s), identified by a single type, and having a single function. For the present study, a speech segment was defined based on the theoretical framework and the objectives for the study using the following variables:

- The author of the message.
- The audience for the message (to whom the interaction was intended).
- The relationship of the segment to other messages (independent versus response).
- Whether or not the segment was interpersonal in nature.
- If interpersonal, what was the cognitive function of the segment.
- If interpersonal, which interpersonal issue was evident.

A change in any one of the six criteria above signified the end of one speech segment and the beginning of another. In this study there were a total of 838 speech segments.

To evaluate intracoder and intercoder reliability for the content analysis separate, duplicate samples were coded and analyzed for test agreement using contingency tables and calculating a kappa value for each of five variables. Kappa values of 0.4–0.7 show fair to very good agreement; values over 0.7 show excellent agreement. Kappa values for intercoder reliability in this study had a mean of 0.67 while intracoder reliability had a mean kappa value of 0.78.

For the variables themselves, chi-square tests for homogeneity were performed to check for significant differences between groups and to determine if categories within each variable were significantly different. Trend analyses for each category within each variable were used to check for patterns over time. The significance level for p-values was set at 0.05.

Results and Discussion

Objective #1: Participation; personal versus group; independent versus response. Participation in the course remained fairly constant (roughly 95 speech segments per group per week) with a midterm dip. The majority of the speech segments were directed at the small group as a whole. As the course progressed, however, there was a significant upward trend in the proportion of speech segments directed at specific individuals, from about 20% to 38.5%. Also, as discussions got underway, the proportion of independent speech segments significantly decreased from 40% to 14% as the proportion of response segments displayed a significant upward trend from 45% to 79%. These results indicate that the participants were increasingly relating to other group members as individuals, not just as a group entity, in an interactive pattern of communication that suggests collaboration and construction of knowledge by the group.

Objective #2: Cognitive, metacognitive, social, or organizational. By far, the predominant function of the communication in the small groups was cognitive in nature. The proportion of cognitive segments rose dramatically over time (from 47% to 82%). Social and organizational speech segments, while initially at approximately 25% each, showed significantly downward trends, decreasing to an average of 10% and 4%, respectively. Metacognitive speech segments were almost nonexistent, probably due to the existence of separate areas of the conference dedicated to metacognitive type comments. These results demonstrate that as the course progressed the communications became less social and more cognitive in nature as the groups became more task-oriented. Organizational communication had served its purpose in the beginning and members evidently felt little need to discuss organizational issues later on.

Objective #3: Interpersonal versus non-interpersonal; involvement, control, openness, solidarity, or control. With Interpersonal speech segments constituting almost 75% of all speech segments in week 3, interpersonal issues were obviously very important at the beginning of the course. They became significantly less important over time but still remained prominent (about 45%) throughout the course. Even though participants were very task-oriented, they were clearly interacting on an interpersonal level, sharing personal thoughts and experiences to add to the construction of knowledge.

Four of the five categories of interpersonal issues proposed by Lundgren (1977) were evident in the coded messages. Solidarity was emphasized the most, rising significantly over the course of the study (from 40% to 54%). Openness also rose significantly from 18% to 36%, while Involvement and Control had significant decreases to average lows of 7% and 3%, respectively. In the sample weeks, no instances of Conflict were found. These findings indicate that participants were reaching out to their fellow group members and sharing of themselves. Involvement and Control issues diminished in importance as members found their place in the group and coordination of group tasks were worked out.

Objective #4: Patterns of group development. The groups were very similar in the linear trends of the interpersonal issues indicating that there is, indeed, a pattern of group development. In order to compare patterns of group development found in this study and those reported by Lundgren (1977) with Schutz' model of group development, Openness and Solidarity in both studies were combined to form a category analogous to Schutz' Affection category. When compared to those reported by Lundgren (1977), the trends in this study were found to be comparable in direction of linear trend as well as relative, and often absolute, proportions of the different interpersonal issues. Affection in both studies is evidently the overriding interpersonal issue, gaining in importance over time. It is unclear what the relative proportions of the interpersonal issues in Schutz' model should be, however he did propose that Affection would increase until it was most prominent in the last stage of group development. Consistent with Schutz' model, the highest proportion of Involvement segments (Schutz' Inclusion) occurred in week 3, declining in importance over time in both studies. Schutz also predicted that Control would peak in importance after Inclusion and then decrease over time. While this occurred in Lundgren's findings, in this study Control never became more important than Inclusion, but it did decrease over time. This could be due to the limited sampling of only three weeks.

What this tells us is that people meeting, discussing, and collaborating as a group via computer conferencing have similar interpersonal issues, at comparable stages and proportions, as is reported in the literature for face-to-face groups. The fact that communication and interaction is computer-mediated does not seem to have a discernible effect on group development in online courses.

Implications for Practice

The findings of this study can inform the use of computer conferencing in group situations. Hopefully, designers of courses and computer conferencing systems will be encouraged to include group activities and interactions in their designs. Realizing that Inclusion and Control are important interpersonal issues in the beginning stages of group development, course designers can incorporate activities that facilitate and enhance successful resolution of these issues. Additionally, these activities need to be supported by the capabilities of the conferencing system. Understanding group processes helps courseware designers create spaces and interactive capabilities specifically for group interactions.

Similarly, if instructors appreciate the importance of group development and anticipate its stages, they will be able to facilitate and manage group interactions more productively. By recognizing potential crisis points, instructors will be better able to modulate the anxiety these crises may generate.

Knowing that interpersonal issues constituted between an average of 75%–45% of communication within the small groups, and that Affection was shown to be very important throughout the length of the course, instructors can encourage and model this behavior from the beginning thereby creating a safe learning environment of acceptance and trust. Activities that enhance sharing and cooperation can further develop openness and solidarity within the groups. Similarly, activities and assignments can be incorporated at the beginning of the course to facilitate resolution of Inclusion and Control issues.

Every medium has its advantages and limitations (including face-to-face). The goal is to understand these opportunities and challenges and use this information to choose the best medium for the task at hand. Once the best medium for the situation is chosen, the advantages can be exploited while compensating for the limitations.

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Autobiographical Sketch

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The Vicarious Learner:
Helping Students 'Listen In' to Learn

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Introduction

Increasingly, the role of dialogue in education is becoming a major research issue in both education and psychology. While the importance of dialogue for learning has been noted by many researchers (Hicks, 1996; Laurillard, 1993; Ohlsson, 1995; Voss, 1996), increasing class sizes and the move toward computer-based courses threatens this component with the danger of disappearing completely. We believe that the role of technology must be to push back the threshold imposed by these constraints, this being achieved by opening up new media for dialogues that are not subject to the same delivery bottlenecks as traditional methods (OECD, 1996).

The present paper describes our attempts to understand how the value of dialogue in learning depends on the structure of the environment in which it takes place. We first describe the concept of 'tertiary courseware' or 'vicarious resources'. We shall present some of the problems we encountered trying to generate such material and some of the solutions we are investigating. In particular, we present tasks with which to structure and focus dialogues more effectively than generally happens in many seminar or bulletin board discussions. Finally, we will briefly describe the system we have developed with which to deliver our courses and to research the effectiveness of tertiary courseware.

The Vicarious Learning Concept

The *Vicarious Learner* project at Glasgow Caledonian University and the University of Edinburgh is looking broadly at issues concerning the role of dialogue in learning. A specific interest, and the origin of the project name, is in the question of whether educational dialogues can be helpfully "re-used" by offering them to other learners who arrive at a problem similar to one addressed in the dialogue (McKendree et al., 1998). We believe this could be a vital element in learning—the observation of peers as learners, the *vicarious learning* experience. What benefits can students gain from dialogue as observers, not just as participants? Can these benefits be maintained for learners at a distance?

Here it is important to draw some distinctions about courseware, and to show how different kinds of support will imply different kinds of technology. "Courseware" is often interpreted to mean the content in a domain, basically like a textbook. This is what we call *primary courseware* and it encompasses many approaches—text, hypertext, multimedia, most Web material.

Secondary courseware comprises tools which learners use to operate on this primary material, and the products of these operations. These could be presentation tools; they might be shells where students compose multimedia essays; intelligent tutoring systems; or concept mapping tools. Essentially secondary courseware supports learning activities of many kinds.

The third sort of courseware, and the main focus of this project, contains structures to support discussion among learners and tutors, and to capture these dialogues in order to make them reusable for the next group of students. We refer to this as *tertiary courseware* (Mayes, 1995). A simple example of this is Frequently Asked Questions (FAQs), but tertiary courseware may be captured from many different kinds of dialogue. Using the computer to capture this material, we are making accessible something which previously has been only a fleeting experience for the small group participants.

We have taught courses in which students learn on-line not only with expository materials and tasks that utilise what they are learning, but also with tertiary resources built from previous terms' discussions and annotated examples of work, as well as having their own discussion forum. We have also run more controlled laboratory studies to look more closely at the learning taking place when viewing these resources (Cox, et al., submitted). We have found, in general, not only positive learning outcomes but positive affective ones in terms of students' feeling that they are part of a larger community and that reading the discussions of others gives them a wider perspective (McKendree, et al., 1998).

TDDS: Tasks for Improving Student Discussions

Despite our generally positive results, it became clear early in the project that one major problem is generating good discussions in the first place (Lee, et al., 1997). Thus, a second focus of the project has been to develop methods for engaging students in effective discussions early in a course. Reasons for student silence in computer mediated discussions (as well as in face-to-face seminars) are many and varied. Some of the reasons discussed by researchers in Computer Mediated Communication for Learning (CSCL) are that students do not want to appear ignorant (van der Meij, 1988), they feel that they are talking to a 'photo-electric wall' (Sproull and Keisler, 1993), they don't know what is expected of them (Bligh, 1986), they feel that peers do not respond in the same spirit as they do (Scardemalia et al., 1992), and they find that it is too much effort and becomes a chore (Newman et al., 1995; Clark and Brennan, 1991).

Even when they do try to discuss, they often find it very difficult and often comment that they have nothing to say. But what does this mean? They have nothing to discuss because they don't know anything? They don't know how to go about discussing? They don't know what they do or don't know, so they can't discuss it? Generally, when students claim they have nothing to say, they actually mean that they have *no reason* for saying anything. Discussion naturally arises out of specific problems or tasks. Therefore, we find it essential to give students a reason to talk, to provide a goal for discussion.

To this end, we have developed a series of Task Directed Discussion games (TDDs) that demand increasingly deeper thinking about the domain to 'ease students in' to discussions (McKendree, et al., 1998). These tasks lessen the focus on trying to learn and reduce the pressure to 'sound intelligent'. All TDDs are based on the idea of eliciting discussions from students by providing them with a common focus; that is, providing a finite set of key concepts that students must structure in various ways. These tasks are often done in pairs and involve them in trying to understand each others' interpretations.

For example, an early TDD is the 'Defining' game. One student draws a term from a pile of key concepts and tries to define it while the other student guesses what concept it is. A more complex task is the 'Repertory Grid' game in which a student selects three concepts and then must describe to a partner the ways in which two of the terms are similar, but different from the third. To date eleven task-directed discussion games have been developed.

We find that these tasks get our students discussing the course content rapidly and more deeply than the more traditional approach of posting discussion questions each week or having them formulate questions that others were supposed to reply to. We found that students not only see no point in these discussions for the reasons cited by other researchers, but often they have just not learned how to start and sustain a deep, meaningful discussion. We found them continually coming to the lecturers and saying, "We just want to know what the answer is". The TDDs get them away from this assessment-focused, 'get the right answer' attitude and into a more fruitful, sustained discussion of complex concepts quickly. The students find the tasks very motivating, we find they elicit very good exploration of the course content, and we find that the students eventually can engage in better learning discussions without relying on the TDDs, but by being able to diagnose their own understanding or lack of it.

What's more, when we use these discussions as vicarious resources, making them available as text, audio, or video clips for other students, we find that the new students become absorbed and motivated themselves. They often comment that they really wanted to jump in and contribute themselves. We are now exploring ways to use these vicarious resources to initially introduce and involve distance learners in TDDs and then to give them access to means for participating in these discussions either with other students or with the machine as a partner.

Conclusions

Our interest in generating structures for better discussions came about through our frustrations with the use of on-line discussion forums in our courses. The TDD approach has worked for generating better discussions and hence better vicarious learning material. Our courses tend to have some characteristics, however, that make them well-suited to this approach. Our courses in general are: (i) largely text based, with case studies; (ii) discursive, such that interpretations of the domain's central concepts are open to debate; (iii) synthetic, i.e. a meeting point for the concerns of many disciplines; (iv) constructive, in that abstract concepts are partially exemplified by working models and systems, some of which students will attempt to construct; and (v) learner centred, in that it invites self-reflection on one's own experiences. Such properties, we feel, make the domain ideal for the application of structured discussion tasks like task-directed discussions.

Our objective has been to provide a clearer basis for approaching the questions of how to introduce appropriate structure into learning dialogues and of the nature of the role of educational dialogue. There are still many questions to be answered involving teasing apart the tangled issues of learning task, dialogue situation, motivation and affect, before we can describe more clearly how the design of any particular tool is contributing to the overall patterns of dialogue that result. Initially, we are creating tools to allow presentation of TDDs as types of generic structure for modulating domain information, with explicit support for the different tasks at the initial stage and a more open framework available for subsequent development of discussion, more like the current discussion environments.

More generally, we hope this will contribute to addressing the problems of how to support educational dialogue both in the classroom and in Computer Mediated Communication for Learning (CSCL) for distance learners. We hope that others will use the vicarious learning and TDD ideas to explore their application in different types of situations and different types of learning environments.

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Using a New Distance Learning System in the Navy

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Commander
Portuguese Navy—CNED

Introduction

The new Portuguese Armed Forces legislation, published in 1990, established the 9th grade as the minimum level of schooling required for the promotion to petty officer. It was also established that by the year 2000 the minimum required would be the 12th grade.

When the new legislation was published, among the 8000 permanent staff of petty-officers and rates, there were 3000 without the 9th grade (9 years of schooling), and out of these there were 600 who had only the 4th grade. Although many of these men were highly qualified, with solid professional training acquired throughout the years in frequent periods spent in Navy schools, all this training did not show through in academic qualifications, especially in what certification is concerned.

Due to this situation, the Navy decided to provide everyone the possibility of obtaining, in useful time, the 9th grade of education. It was decided that it was to be carried out through a distance education system, since it was the best way to encounter both the Navy's and its target population needs.

Some of the factors that led to this solution are:

- The personnel is dispersed throughout the country, including the Azores and Madeira archipelagos, and sometimes even engaged in missions in foreign countries.
- Many of the potentially interested people were assigned to ships with a high rate of mobility.
- The impossibility to send several hundreds of men to school for a period of 2 to 3 years risking the Navy's immobilisation for lack of personnel for ship garrisons, besides the fact that it would be economically impracticable.
- All potential learners are adults and are interested in advancing in their naval career, their motivation was expected to be high.
- Given the high number of learners and their diverse situations it would be essential that the Navy should provide equal opportunities to everyone.

- The Navy had previous experiences in correspondence learning courses, which had many attendants.

The Naval Center for Distance Education (CNED) was created to conceive and co-ordinate the launching of the 9th grade and the future development of distance education.

Therefore, studies to develop a model that guaranteed the access to the petty officer's career, by certifying them with the 12th grade of education and the 3rd level of professional qualification (Figure 1), led to a curricular development model which uses a continuous training system, either by distance or by face-to-face training modes.

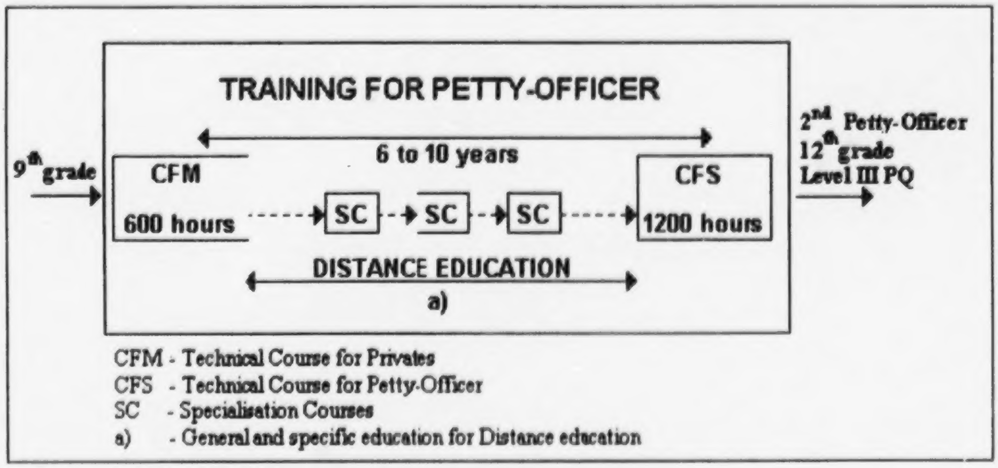

TRAINING FOR PETTY-OFFICER
6 to 10 years
9th grade
CFM
600 hours
SC
SC
SC
CFS
1200 hours
2nd Petty-Officer
12th grade
Level III PQ
DISTANCE EDUCATION
a)
CFM - Technical Course for Privates
CFS - Technical Course for Petty-Officer
SC - Specialisation Courses
a) - General and specific education for Distance education

Figure 1

This model relies on the following principles:

- The adoption of concepts like "units providing credits" for the development of curricula, academic and professional certification.
- The combination of face-to-face training at school and on-job training for more technical components at working places and a distance education training for general and some specific training.
- The reduction in time of personnel permanency in schools.
- People's ability to manage their own career in a perspective of continuous training and lifelong learning.
- The possibility to combine different learning rhythms with the Navy's demands.

One of the most outstanding characteristics of distance education is the separation in time and space between the act of teaching and the act of learning, that is to say, the separation between the teacher and the student.

The isolation situation in which the learner carries out his learning process, forces him to be autonomous, to a higher or lower degree, and, most of all, to be responsible for his own training. In this perspective, to develop a learner centered system is to develop a system that provides him a learning process over which he has as much control as possible.

The Learning Model

The model that we decided to adopt has its foundations in the field of the constructive, social-cultural and system theories, focussing its attention on what the learner really does while he is learning. The learner centers its attention in the functions and tasks that he has to go through, while he is learning to learn. The main goal of all those who intervene in the learning process—institutions, teachers and tutors—is to offer opportunities to the potential learner and to help him apply and practice the necessary functions to learn.

The Use of "IT" in the Secondary Education Courses

We are dealing with a training system focussed on the learner and on his needs, and all the issues—the course planning, the development, production and delivery of materials, as well as the support to his learning—converge to him.

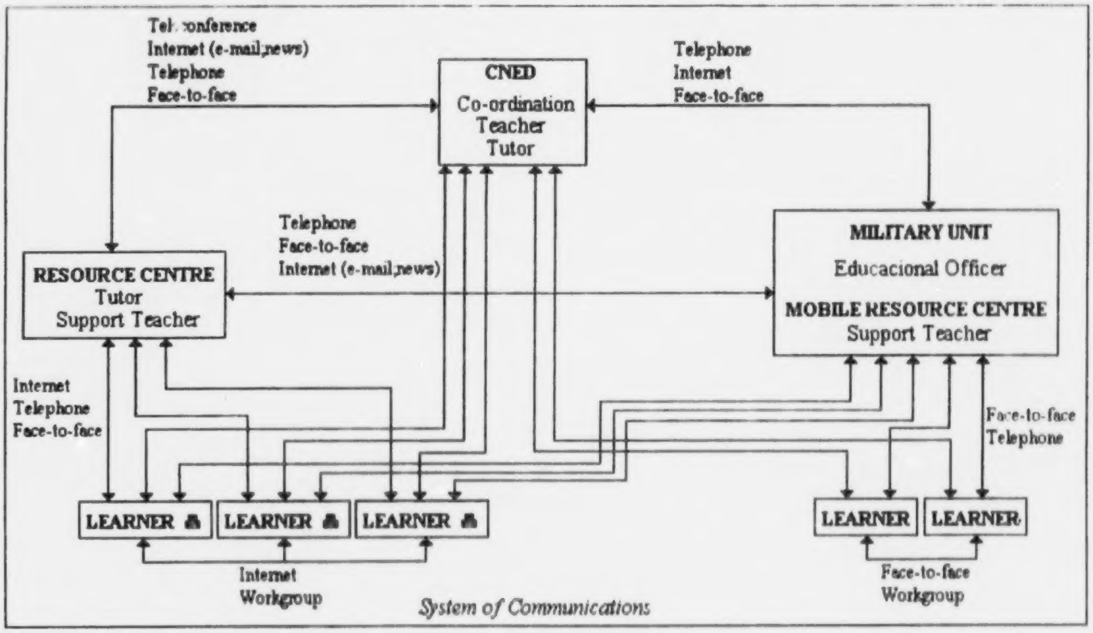
In order to achieve these objectives it is necessary to consider the following issues:

- **Context:** How do we characterise the environment surrounding the learner and the learning materials? How and who is going to use the course or the program?
- **Tasks:** Which tasks are compatible with the existent pedagogical or other means?
- **Tools:** Which cognitive and material tools are necessary to carry out these tasks?
- **Interface:** Which learning interfaces are going to be used? Written materials, software, kits, etc.

When we first approach these issues, we realise that the use of IT (Information Technologies), leads to an immediate consequence: the expansion of the dialogue possibilities, consequently leading to the decrease of the transactional distance and the increase of the learner's possibilities to take a stronger control over his training. This also means that we can make the structure a much more flexible one, thus providing a bigger offer of training paths within the course's same set of objectives (Figure 2).

CNED used IT for the development of a course for the 7, 8 and 9th grades of education exclusively for the course's management. In the course for the 12th grade, presently being developed, IT will be used in an extensive way and will integrate all the constituents of the course. Naturally, we will take into consideration the fact that a very significant number of students are in professional situations where the use of new technologies will be difficult or even rare. Therefore, we have been giving special attention to the material's design, in order for them to be the main providers of the necessary conditions for the learner to perform his functions.

In what learning detachment is concerned, CNED is developing a program for a bank of items which will make it possible for any learner to ask for a formative test and to do his summate evaluation in the same way, although under specific security conditions.


Tel conference
Internet (e-mail,news)
Telephone
Face-to-face
CNED
Co-ordination
Teacher
Tutor
Telephone
Internet
Face-to-face
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Internet (e-mail,news)
RESOURCE CENTRE
Tutor
Support Teacher
MILITARY UNIT
Educacional Officer
MOBILE RESOURCE CENTRE
Support Teacher
Internet
Telephone
Face-to-face
Face-to-face
Telephone
LEARNER
LEARNER
LEARNER
LEARNER
LEARNER
Internet
Workgroup
Face-to-face
Workgroup

System of Communications

Figure 2

The Application

A proposal to develop a system to support the new schooling management model that CNED wanted to implement, was submitted to the Navy's Information System Department (DAMAG) in the first quarter of 1997. That proposal was evaluated and it was considered to be developed "in-house."

Since DAMAG, an IBM mainframe shop since the seventies, had adopted new development tools in 1996 (Designer 2000 and Developer 2000), based on Oracle RDBMS version 7.3 and Windows 95, it was considered that these tools would be appropriate to develop the new system.

The development began in July of 1997. The main purpose of the project was to develop a system which reflected the new Distance Learning model, allowing the creation of item banks and the automatic generation of tests.

Items should be classified on a well-structured curricular basis, which should apply the standards of the Portuguese Government Education Department. On the other hand, items should be calibrated in order to determine its difficulty. Whenever the item is included in a test, automatic calibration of the items should take place. A variant of the RASCH model was adopted to engage item calibration.

On the other hand, every student should have an ability levelling system in order to determine the student's evolution in the course. When a new student starts a course, he is submitted to an ability-levelling test, with a set of well-calibrated items, which will determine in what curricular level he is. Then he will be informed which areas he will need to cover to pass through the course.

Since the probability that all students are at the same ability level, is low, there is a need to generate tailor tests, adapted to each student. By knowing the student's ability, it is possible to generate revision tests, abilities improvement tests, and final tests for each students requirements to achieve the same goal, passing through the course, and obtaining the degree certificate.

Conclusions and Further Work

At this moment, four modules have already been released to CNED to be tested (Administration and Security, Students Management, Courses Management and Evolution and Configuration Control), while the item generation module is starting to be developed. The Portuguese Navy's Intranet is looked-up as a good way to get through a great number of the CNED students. Access can be made through equipment installed on their military units, by stationed support centers or by mobile support centers with support materials, in order to tighten the relation with the system.

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Practice Makes Learning

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WIDS-Wisconsin Technical College System Foundation, Inc.

In distance learning it is particularly tempting to become so engaged in figuring out how you can use the technology to deliver information to your learners that you neglect the front-end design of the *what, how* and *when* of the *learning*. Up-front organization, clear communication about performance expectations, outcome driven assessment, and imaginative learning strategies are even more critical to successful distance learning than they are in a classroom setting. When you and your learners are not physically in the same place at the same time, careful instructional design, based on what we know about how people learn, provides a map that guides you and your learners toward successful completion of a learning experience.

Methods and Media

Differentiating between media and methods is the first step toward ensuring that learning and distance are not contradictory. Instructional methods cause learning. Media deliver methods. Ruth Clark, Business and Industry Training Consultant, describes methods as "techniques that support cognitive processes that lead to learning." Examples of instructional methods include practice, simulation, discussion, presentation, demonstration, role play, questioning, debate, etc.

Dr. Clark goes on to define media as "delivery devices or strategies that carry methods." They do not cause learning in and of themselves. Examples of instructional media might include audio, video, computers, Internet—in the high tech arena. More traditional examples are transparencies, print materials, and even presenters, and instructors.

Studies show that though media and delivery format may affect accessibility and even satisfaction, given equivalent instructional methods, media do not impact the effectiveness of the instruction. When we design learning activities, we want to *first* concentrate on methods for helping learners learn. When we address the selection of distance learning media to deliver instruction, we may need to adapt some of our learning activities, but in doing so we need to be carefully creative to minimize any compromises that negatively impact the effectiveness of the learning.

Only after you have determined *what* your learners need to be able to do and how you will know *when* they have achieved the *what*, is it time to plan *how* your learners will get there. Though it is tempting at this point to focus on the delivery of content information, your learners' success depends on your resisting that temptation to first consider what methods (strategies that cause learning) you will build into the distance learning experience.

How Does the Learner's Mind Work?

Noted leader in adult education, Patricia Cross reminds us that "how learners are taught lies at the heart of quality education. It makes the difference between a lifelong learner and a grade grabber, between enthusiasm for learning and indifference to it, between an educated society and credentialed one." We know that most learners learn better when they are actively engaged in the learning process. In distance learning it is even more important to abandon a "telling as teaching" mode for learning methods that support the human thinking and learning process.

The Three Memories

Before you launch into the design of learning activities, you may find it helpful to consider how learning works within the learner's mind. In his book, *A Celebration of Neurons*, Robert Sylwester compares the organization of the memory system to the organization of an office. In the office we process vast amounts of information that compete for our attention. To cope, we label some information "junk mail" and discard it. We handle or process other information immediately and forget about it. Some information we store to be handled later; some we put into permanent files with related information; and other information we incorporate into new or existing procedures for operation.

Our brains have three memory systems that deal with information processing and storage: the sensory memory, the working (or short term) memory, and the long term memory. The sensory memory takes in enormous amounts of information. This memory system has a large capacity, but a very short duration (visual as little as .2 of a second; audio a maximum of 4 seconds). It selects a subset of the information that comes in (junking—ignoring the rest), transmitting the selected bits directly to the long term memory for storage or to the working memory for processing.

The working memory receives data taken in and selected by the sensory memory. The working memory then processes the selected information. It is our center of consciousness—our center of thinking. Though the working memory is very powerful in its ability to process information, it is also very fragile. Its capacity for quantity of information is limited to 5 to 9 chunks. Chunks are units of information that vary in size depending on the expertise of the individual. We know this as the rule of 7 +/-2.

The working memory also is limited in duration. Without rehearsal (practice), a chunk of information will last about 12 seconds. Thus the alternative label "short-term" memory. The working memory continually monitors the data being delivered by the sensory system, simultaneously prioritizing, editing, focusing, and shifting attention to important, interesting, and familiar information. It continually allows us to shift chunks of information between the foreground and background so that we can experience and respond to the current situation.

The third memory system is the long-term memory. It is considered permanent memory and serves as our repository for storing information. The long-term memory has immense capacity.

Five main processes control the flow of information through the memory systems: attention, encoding, rehearsal (practice), retrieval, and metacognition. Attention allows learners to select a sub-set of information that comes into the sensory memory for processing in the working memory. Encoding allows the learner to store information in any of the three memories. During rehearsal/practice the learner processes information in the working memory. It is *only* through rehearsal/practice that learners can encode information to long-term memory. Since the information in working memory lasts only up to 12 seconds, learners do not learn anything until they have stored it in their long-term memories. *In other words, learners cannot learn without practice!*

In order to process information in our long-term memories, we need to retrieve it, bringing it to the working memory—our conscious mind. How many times have you seemingly "forgotten" a name that you are sure you know? You know the frustration—"It's just on the tip of my tongue." Actually, you have not "forgotten" the name; it is still in your long-term memory. Your problem is retrieval. In humans our working and long-term memories function together. As Robert Sylwester points out, "Short-term (working) memory allows us to experience the present, but we would become a prisoner of the present without the two interrelated forms of long-term memory."

The fifth process, metacognition, is not sequential, but functions as a monitoring system. The learner uses metacognitive process to set goals, select strategies, monitor progress, and adjust learning strategies.

Cognitive Overload

Cognitive overload is what learners sometimes refer to as "fried brain syndrome." It happens when the fragile working memory cannot process information in the quantities or at the speed with which it is being presented. Nothing is learned until learners encode it into long-term memory. Before entering the long-term memory, knowledge must be processed by the working memory; that is—practiced. Since the working memory can handle only so much material, a logical strategy for avoiding cognitive overload and maximizing its use is to clear out the clutter with meaningful practice that moves information from the working memory to the long-term memory.

Learning Styles/Processing Preferences

Research tells us that people learn in different ways. In distance learning environments it is easy to fall victim to a teaching-centered, rather than a learning-centered, approach. When we focus on teaching, we often try to mold all individuals into reflective, abstract, analytical, sequential learners. Moreover, teaching methods that focus heavily on giving information are easier to adapt to distance learning than are more learning-centered methods. In this teaching-centered environment the active, concrete, feeling, holistic learners struggle to adapt, but many of them just cannot succeed. They need to learn by *doing*.

Designing Effective Learning Methods

Surely distance learning is fertile ground for the application of numerous theories rooted in educational psychology and teaching methods. However, you may not have the luxury of returning for four to six credits of graduate work prior to designing your distance learning experience. As you plan your next distance learning course, these five strategies will help you move a long way toward ensuring that distance teaching also means distance *learning*:

- Provide learning plans
- Design with a bias for learner-centered methods
- Insert frequent practice

- Support all stages of the learning cycle
- Vary the format of learning activities

Provide Learning Plans

Metacognition is the learner's internal process for monitoring learning. Learners use metacognition to consciously apply study skills and to reflect on the process they have used to solve a problem. Learning plans lay out a road map for learning one competency or two-three related competencies by spelling out performance expectations—*what* learners will learn; explaining assessment—*when* you will know they have learned; and identifying learning activities and materials—giving learners a plan for *how* they can learn. A learning plan gives learners an advanced organizer that helps them consciously set goals, select strategies, regulate their progress, and adjust personal learning behavior. Though learning plans are very helpful in traditional, instructor-led learning environments, they are *critical* in distance learning situations where learners do not have frequent, in-person access to teachers.

Design With a Bias for Learner-Centered Methods

Learners learn best when they are actively engaged in the learning process. Though learning activities fall on a continuum somewhere between teacher-centered and learner-centered, the best measure is the level of passivity or involvement on the parts of the learners.

It is obvious that teacher-centered learning activities such as lecture and demonstration place the teacher in an active and directive role, and learner in a more passive role. What may not be as obvious, however, is that common distance learning activities such as reading teacher-selected texts and teacher-produced materials, viewing teacher-selected videos, and performing highly structured drill and practice are also predominately teacher-centered.

In learner-centered learning activities, teachers play a facilitation role, while learners play an active role. There are countless varieties of learner-centered learning activities such as role play, chat room discussions, interview, solving case studies, researching information—perhaps on the Internet, performance of a skill, reading learner-selected materials, developing learner-designed job or learning aids, and so forth.

Well-designed learner-centered activities cause critical and creative thinking. Because they involve learners, they also assist in the process of encoding learning into the long-term memory. Learner-centered activities hold learners' attention; support multiple learning styles or processing preferences; and provide metacognitive opportunities as learners are required to set goals and solve problems. Learner-centered activities make learners full partners in the learning process, teaching them how to learn, and requiring them to take responsibility for their own learning.

Insert Frequent Practice

Learning activities do two things—help learners acquire information or cause learners to practice. The simplest strategy for helping learners avoid cognitive overload is to chunk instruction into short, informative lessons that are punctuated by frequent, meaningful practice. When you provide feedback to practice, you do more than just clear the working memory. You support metacognition by providing continuing improvement assessment that helps learners rate their learning success and helps instructors judge their teaching effectiveness when they can still make needed adjustments.

There are two types of practice—maintenance and elaborative rehearsal. Maintenance rehearsal involves repetition and memorization. It uses a great deal of energy, and may require as many as 500 repetitions before many learners can perform the skill or use the knowledge automatically. Though maintenance rehearsal serves to keep information active in the working memory, it also clutters this fragile, short-term memory. Consequently, it is not very efficient.

Elaborative rehearsal causes learners to interact with the content. This type of practice connects the new content or skill with what learners already know; applies practice to the solution of real problems; creates something new. Elaborative rehearsal is the more efficient way to encode information into long-term memory. Though examples of elaborative rehearsal are unlimited, we might include solving a case study problem, engaging in hands-on practice, examining how prior personal experience relates to the current content, creating a scenario that applies the new knowledge, taking and defending a position, synthesizing multiple ideas and perspectives, etc.

Support the Learning Cycle

When you develop learning activities for a competency or several related competencies, you are creating a plan that guides learners through the process of learning. We represent the learning process as a cycle (Figure 1). There are four major stages: motivation, comprehension, practice, and application. Each stage supports one or more of the five thinking processes: attention, encoding, rehearsal, retrieval, and metacognition. When you select the learning activities for a learning plan, choose activities that provide a framework guiding learners all the way through the cycle.

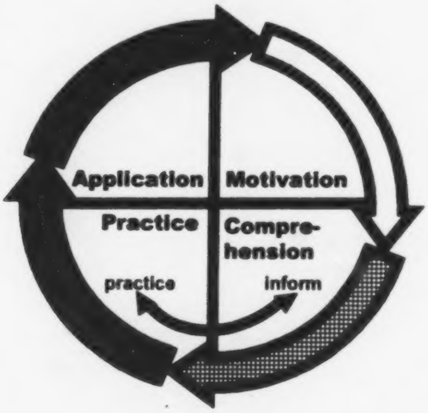

Figure 1

At the motivation stage you facilitate the attention process by inspiring learners to learn and answering the question "Why do I want to learn this information or skill?" During the comprehension stage you facilitate encoding and processing in the working memory by clarifying performance expectations and helping learners access the information they need to perform the target competency. In the practice stage you need to provide guided practice—elaborative rehearsal, giving feedback to facilitate encoding to long term memory. Finally, at the application stage foster retrieval from the long term memory to enable working memory processing on demand. During the application stage learners need to show that they can apply what they have learned to real world problems and decision-making. It is during the application stage that you build in assessment.

When you design learning plans, move learners through the cycle: motivation, comprehension, practice, and application. However, learners need to swing back and forth between stages comprehension and practice before moving on to application. By doing this you help them avoid cognitive overload by chunking the learning into manageable pieces and punctuating it with frequent practice.

Vary the Format of Learning Activities

The way individuals learn depends on how they typically take in and process information. You can make your distance learning course friendly to differing learning styles and intelligences by varying the method (the learning strategy), media (the delivery mode), environment, interpersonal context, feedback, and givens.

You can choose from a limitless variety of learning methods by using various combinations of presentation, simulation, investigation, guided practice, projects, feedback, memory aids, graphic organizers, information seeking, information receiving, teacher-directed reading (textbooks or course materials), learner-directed reading, and so on. You can also vary the learning environment by creating learning activities that call for them to go into the community, centers for culture such as museum, or workplace.

You will enrich the variety by designing individual and collaborative learning activities that call for pairs, small or large groups. Even though distance learners may be learning via Internet, video, audio, etc., you can direct them to construct small groups on their own, or you can form discussion groups via E-mail, phone, or even snail mail.

Givens (what you provide for learners as prompts, information or tools) provide any number of options for varying learning and practice. You may provide a case study or a scenario as a prompt; you may give learners a particular problem to solve or topic to address. In guided practice you might provide a product or piece of equipment with flaws or errors that must be corrected. An even more effective variation is to have learners bring in or construct their own "givens," drawing on their experiences for relevant examples and problems.

Though one type of media may be dominant in your particular distance learning situation, you can reach a broader range of learners and learning styles by incorporating different types of media to deliver the instruction. If you have access to some of the newer technologies, you may use computer simulations, computer-based lessons, computer-based practice, satellite conferencing and even the Internet to deliver a portion of the learning.

Even in a "low tech" environment you can vary media with a rich combination of auditory learning (lecture, audio tape, radio), visual learning (transparencies, slides, flip charts, video, demonstration), and tactile learning (manipulatives, models, hands-on practice). You can vary delivery of information by giving learners access to guest speaker and panel presentations, and by filling differing roles as instructor (remember, you are media too) such as coach, facilitator, learner, presenter, questioner, etc.

Tools for Designing Learning

Educators and trainers in The Wisconsin Technical College Technical System, over 200 Wisconsin K–12 Schools, several University of Wisconsin Campuses and in schools and businesses in over 21 states and five foreign countries are using the WIDS Model and software to design learning-centered courses and workshops. WIDS offers a model, software, and a video course which work together to help teachers enhance the effectiveness of learning—at a distance or in person. The WIDS Software supports the design of learner-centered learning activities that are rich in practice. For more information about WIDS visit http://www.wtcsf.tec.wi.us/wids or call 1-800-821-6313.

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Autobiographical Sketch

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The Effectiveness of a Web-Based Interactive Multimedia System in Tertiary Education

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Abstract

Many hundreds of hours have gone into the preparation of the multimedia system for the USQ unit, Introduction to Management Science. This multimedia system is placed at the heart of a total technology approach to teaching (TTAT) which interlinks various technologies in delivering unit material to both internal and distance education students. The System won the USQ Inaugural Award for Excellence in the Design and Delivery of Teaching Materials for the author in 1997. The results of a survey conducted during the course indicated that students were very enthusiastic about the new multimedia package.

Introduction

Introduction to Management Science is the very first unit within the discipline of Logistics and Operations Management in the Faculty of Business, University of Southern Queensland.

This unit has been growing in popularity over the past nine years (from 50–60 students to 250–300 students per year). The subject provides a basic background and introduction to various decision making tools, techniques and approaches which rely on both quantitative and heuristic models. All students, who wish to take the discipline as their first or second major, or study it as an option, take this unit.

The Unit Leader for Introduction to Management Science (the author) in conjunction with colleagues from the Distance Education Centre of the University of Southern Queensland has designed and developed the multimedia system for this subject. This project has been supported by the Faculty of Business and endorsed by the Flexible Delivery program of the University of Southern Queensland. The main objective of this project is to provide supplementary and additional components, which enhance and complement the existing material and teaching methods.

Educational Philosophy in Developing the Multimedia System

This multimedia system was designed upon considering the fact that a number of different types of media are utilised in delivering a lecture. For instance, audio is used when a lecturer enters a lecture room and starts talking to the students. Text is used when a reference to a section of a book is made. When an image is placed on the overhead projector or drawn on the board, and the lecturer starts explaining various features by moving the hands or the pointer over it, an attempt to make 'animations' is simulated.

These media (audio, text with links, video/animation) make the lifeless text and images alive (a living book). Hence, those students who are studying in distance mode and cannot take advantage of the teacher/student interaction will benefit from the system.

Above all, multimedia can offer all students the same opportunity, with added features such as the ability to allow the learners to sit in the driver's seat and steer the way towards the goals they wish to set. In the case of this particular system, a prescribed route or series of routes are also incorporated into the system for the benefit of those users who wish to have more guidance.

Special Features

One of the main features of this multimedia system is its ability to facilitate the teaching of complex concepts via specially designed animations and simulations. This feature enables all students, regardless of their geographical location and means of interaction with the University, to enjoy that extra level of explanation which is usually conveyed during a traditional face-to-face lecture or tutorial situation.

For instance, the solution to the classical optimisation problem of finding the maximum area of a rectangular paddock which can be enclosed with a limited amount (say, 400 metres) of fencing is animated in an interesting way.

The animation provides the theoretical and practical approaches in parallel. On the left-hand side, the area of the paddock changes using the same perimeter, and on the right-hand-side, the graph of this change is plotted. A little humour is also included; as the maximum is achieved the cow in the paddock moos to demonstrate her satisfaction with the largest paddock for grazing!

Students are able to interact with the animations and investigate different situations. This type of approach is adopted and used throughout the unit. Hypertext links to explanations and links between various sections of the material are also amongst the features of the system. Students can even launch their Internet NEWSREADER to connect to the NEWSGROUP specially assigned to the Computer Mediated Communication (CMC) for this subject. This is achieved from within the same program.

A Total Technology Approach to Teaching

It should be noted that this multimedia system is also adopted in conducting the face-to-face lectures. This is achieved in a lecture theatre equipped with a multimedia computer, multiscan projector and a large screen. This way of conducting lectures has had many benefits, including:

- instant access to the right piece of information via hypertext links;
- enhanced presentation of material with supplemented sound, graphics and interactive animations; and
- student exposure to more efficient navigational techniques as demonstrated during the lecture.

The NEWSGROUP specially set up for this unit is being used by the author as a means of virtual consultation with students (7 days a week), and for providing guidance and direction for using the system effectively. Sherry (1996), who notes that there is an increasing level of interactivity between students and teachers even in rural and isolated communities, supports the use of newsgroups and other electronic forms of communication. Their effectiveness has also been demonstrated by the positive feedback received from students participating in the multimedia project.

As we now believe that students construct their own knowledge, with guidance from teachers, many teachers are now offering students resources which encourage their independent exploration of the materials provided (Berge and Collins, 1995). Jedege (1992) claims that constructivism (as it is termed as) does not view knowledge as a fixed entity but also recognises that it is not transferred from one knower to another. It is therefore important that learners be actively engaged with the instructional materials to construct their own meanings through an "interpretive process, which unravels their world in a personally meaningful way." If Jedege is correct, then the more opportunities there are for students to interact with the study materials and the multimedia package, the more likely it becomes that the students will construct their own knowledge of a subject.

In order to motivate students to produce academic outcome in accordance with constructivist guidelines, "Download, Discussion and Quiz of the Week" have become regular features. These tests and quizzes provide instant feedback to students. For instance, the Download of the Week allows students to download new media such as multimedia tests, and the Quiz of the week lets students participate in on-line quizzes. The quizzes, which utilise Internet forms, are electronically sent to the Unit Leader of the course. After processing and marking, a feedback message is e-mailed to each student who participated in the Quiz. This process is not just allowing learners to interact with the materials, it is encouraging them. The feedback is assisting students to gain a better understanding of the subject matter.

Hence, this multimedia system is placed at the heart of a total technology approach to teaching (TTAT) which interlinks various technologies in delivering unit material to both internal and distance education students. This supports the beliefs of Prawat and Floden (1994) who claim that to implement constructivism into teaching, a more "complex interactive and evolving" model of instruction is needed. Perraton (1988) claims that the distance educator becomes a facilitator of learning through the most appropriate choice of the media available. Hence, the decision was made to use the mixture of media chosen for this unit.

What Do the Students Think of the System?

To gain some idea of the students' responses to the material, a survey was conducted with the forty on-campus students who attended the class in the fourth week of the semester. These students were asked to compare this unit with others they had studied that were similar in nature to Introduction to Management Science. Most of the students indicated that they thought the enhanced study materials were better than the material in the other units and that the multimedia package helped them to understand the content of the material better. They also believed that the multimedia system helped sustain interest in the materials.

When asked for their views on the multimedia package, comments such as 'interesting', 'fun', 'good', 'helps us to understand the course better' were the main responses. All the responses indicated that the students had positive thoughts and comments about the package and enjoyed using it.

When asked about the user-friendliness of the system, the students rated it as good to excellent (see Figure 1). Most of the ratings were good to very good and a few felt the user-friendliness was excellent.

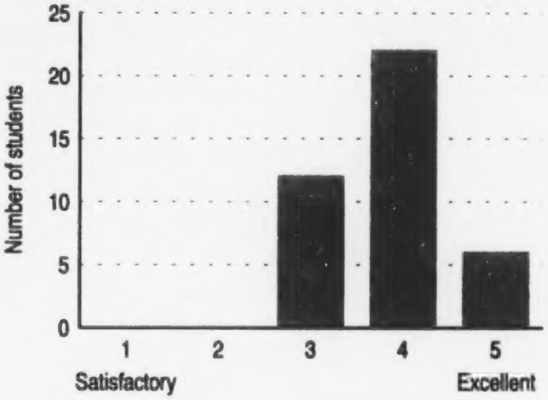

Figure 1. The user-friendliness.

When asked about the navigational features of the system, more students rated them as excellent with, again, all students listing them as good to excellent.

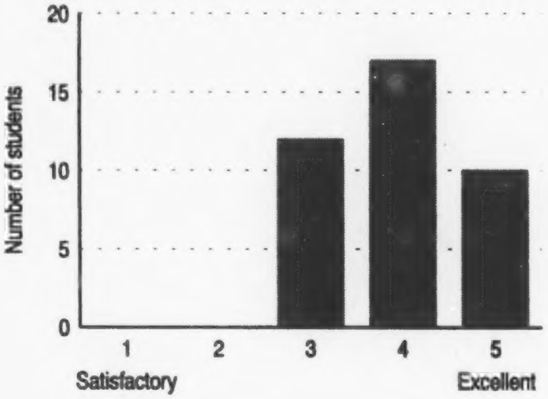

Figure 2. The navigational features.

Conclusions

It can be concluded that the use of interactive multimedia will be a positive step in the direction of enhancing the learning process for this course. The positive responses of the students also demonstrate that the system is an effective means of reinforcing the learning process, particularly for those students who are not able to take advantage of the traditional (face-to-face) mode of delivery.

Integration with the web has allowed the author to update the materials continually and include quizzes and downloads for student further assistance.

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Harness the Power of MPEG2 Advanced Video Conferencing for Simple-to-Operate Instruction and Diagnostics at a Distance

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Introduction

Digital Transport Technology for Video

From the time interactive video networks were first used for distance learning and telemedicine, the challenge has been to select a point in the development of new technologies that won't make your system obsolete before you finish getting it installed.

After you've made a choice, your technology plan can be updated to include a "transition plan" to take advantage of the next improvement in transport technology and network infrastructure.

Digital Video Review

We are going to discuss the current point in the development stream for high quality multimedia transport: MPEG2 (Motion Picture Experts Group) using ATM (Asynchronous Transfer Mode).

To put MPEG2 in context, Table 1 provides a brief review of the interactive video digital transport development stream.

MPEG2 Advantage

Each advance in the deployment of more robust digital services is followed by an advance in the transport technologies that depend upon the increase in bandwidth. Video services continue to be the most demanding users of expanded bandwidth.

Distance learning that emulates the traditional instructor/classroom model depends heavily on more and better video. When an analog TV signal is digitized with no compression, it will occupy approximately 200 Mb/s of that digital service. Even with the improved processing in today's codecs, packing 200 Mb/s into 1.544 Mb/s or less severely affects the amount of information that survives the compression process. The result is useable for one video and the accompanying audio, but there is little left over for anything more than the data signal required to switch and control the video system.

The combination of ATM and MPEG2 has the potential to open up the bandwidth gates for excellent image and motion handling that does not rob from the data bandwidth to give to the video. Because the ITU-T established standards for MPEG2 video, it can also open the gateways of inter-operability for advanced video conferencing.

Table 1

Transport Service	Equipment, Capacity and Standards	Video Quality	Interactive Applications
Public switched digital services	sw 56/64 and ISDN codecs:112/128 - 384 kb/s. ITU-T H.320/H.261/T.120	Motion artifacts in video. Moderate to severe latency	Dial-up business conferencing, video/audio or data
Dedicated digital services: T1/OC1	T1 codecs: 384 kb/s - 1.544 Mb/s. ITU-T H.320/H.261/T.120	Latency solved by processing at full T1. Minor motion artifacts.	Distance learning, tele-medicine. Can support standards-based video/audio and data
Dedicated digital services: OC3/DS3	Motion -JPEG coders/decoders. up to 45 Mb/s. Proprietary algorithms. JPEG standards support still image transfer.	Can allocate for 1TX, 3RX video w/excellent quality. Must use gateways to inter-operate with other systems	Distance learning, telemedicine, tele-justice, public safety surveillance, T1 for voice & data. Multipoint connections require central (hub) switching
ATM over SONET digital service	MPEG2 coder/decoder: to 100+ Mb/s	Broadcast quality video, high-resolution images. Can allocate bandwidth for multi-services. Multipoint uses "edge-switching." Video, audio and data are independently addressable.	Distance learning, telemedicine, VOD (video on demand) broadcast video, medical imaging, high speed data services. T1 for PBX interconnects, voice.

The Interactive Multimedia Classroom

Added Power to Access Resources

For education, the three receive and one transmit continuous view classroom can add the LAN/WAN for collaborative computing and Internet resources. Because some MPEG2 connection hardware to the ATM SONET network does not require the multi-point control switching used in the hub configuration, each video, audio, data signal can be sent directly to any other site(s) on the network. This switching capability developed for an

MPEG2/ATM system will give instructors access to all the media, knowledge and interactive resources on the network.

Added Complexity

The flexibility of the independent switching mode will challenge site and network operations. The more options for dynamic configuration of a session, the more the demands of managing the technology detracts from the focus on the learning experience. With the power of the MPEG2 system, an instructor will be able to have a single class that includes students or team instructors via standard room video, desk-top video, remote modem dial-in, and Internet connections.

To further complicate the configuration, some ATM service providers may charge not by the line, but by the bytes used. Telemedicine consultations may have extreme variations in bandwidth requirements during a single session. They are one example of users that will require detailed information on network costs to support consultation decisions and billings.

Software Solutions for Complex Networks

"Smart" room and network control software can make the multimedia classroom and MPEG2 network useful and efficient for a wide variety of user groups.

There are four components to a complete network scheduling and control system:

1. Room control software, the best of which are Windows™ based room control systems that directly control the local equipment plus many of the pick-up and display devices at the remote sites.

2. Scheduling software which gives authorized network management personnel the ability to access a database, set-up all session parameters and enter events on a centralized schedule for any future time period.

3. Connection control software which activates events in response to the scheduling software by sending control signals to the network's switch control equipment. The connection control software generates the records of events and will store information including the time, date, participants, duration, network resources used, etc. for billing or system usage documentation.

4. Network management software can monitor the performance of the network and identify the status of network devices and line usage for trouble-shooting and bandwidth allocation.

As MPEG2 over ATM networks become more widely available, the power and flexibility of the control software will be as important as the network hardware. A single network will be capable of supporting education, telemedicine, government communications plus a wide variety of other private and entertainment TV uses, some of which are yet to be determined. The user access to this level of communications capability must adapt quickly and easily to a wide variety of applications.

It is important to remember that development will continue. As this year's session of the ITU-T meets, new standards will emerge that govern the inter-operability of video, speech and audio communications. Flexible control software that can adapt to the requirements of heterogeneous networks plus standard's based hardware is a good way to prepare for the next step into the communications future.

Autobiographical Sketch

Ken Olson, Vice President of Technology and Engineering at Todd Communications, is responsible for assessing new technologies for applications in distance learning and telemedicine. With over thirty years of experience in telecommunications engineering, Mr. Olson provides leadership to the Todd Communications product development team in directing development of the TC Reliance family of software based room and network control products.

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The Concept of Intellectual Server: What Should It Include?

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At the moment distant learning (DL) introduces a new stage in developing of methods of tuition by correspondence which uses achievements in the fields of computer technologies and telecommunications. The main feature of distant education distinguishing it from the traditional education by correspondence consists in the use of computer networks including global networks (e.g. Internet) as the means of communication.

Education, information in a high-technological society is one of the main values, without knowledge the activities in almost any field are impossible. The growth of amounts of information accumulated by the mankind has an avalanching nature. Technologies are consequently improved, new ones appear.

In such situation appears a need in dynamic, constantly renewing, available for everybody education, who comes to every house. It is especially important that this method of education can give the opportunity to conduct studies in a way that is comfortable for a student. It is necessary to take into account individual features of students and their wishes. It will affect the duration of a lesson, the speed of passing of educational materials, etc. This form of education can be preferable for different groups of population but for disabled people it is the only that can resolve an existing contradiction: when people who wish and can learn and then work for the benefit of society, have no opportunity to realize their abilities because of impossibility to receive a high-quality education.

The problem of receiving higher education (and secondary too) by many talented people who can't attend lectures and seminars in higher educational institutions because of their physical disabilities is one of the problems in the field of education standing before the society of today. Equal opportunities in receiving an education are the guarantor of social equal rights and possibility of self-realization of an individual in a society.

This problem of education for disabled people couldn't be solved within the framework of existed system of education. There were three forms of education: day, evening and education by correspondence, and only the latter could be used for this purpose but it had a number of shortcomings. They are: static presentation of information, difficulties with postal correspondence, large intervals in the exchange of messages (e.g. student's question—tutor's answer), absence of living communication between student and tutor in the real scale of time and so on.

Only intellectual computer technologies and distant learning based on them can give the possibility for disabled people to receive an education corresponding to world's standards.

With the help of computers connected to telecommunication networks, these people can find many friends all over the world, won't feel themselves isolated, will be able to receive a required education and find a job with computer.

In order to achieve results in solving this problem we (the department of distant education of North-Western Polytechnic Institute, Saint-Petersburg, Russia) develop a project of creating a DL center for disabled people, first one in our region. The project consists in several stages: organizing a DL server, developing educational software, mechanisms of informational exchange. But the substance of the project consists in the concept of intellectual server performing the following functions:

- **Automatic renewal of information on the client-side according the changes in information contents on the server-side.** This feature will help to periodically update the contents of the courses, what is especially important in such fields as computer technique, software, political and economical studies where new information constantly appears, changing criteria of evaluation, giving new overview on the problems. Renewal can take place every time the student connects to DL server; the agent responsible for renewal compares the dates of file's creation on the server-side and on the client-side and sends updated file to the student.

- **Dynamic construction of educational courses basing on the results of preliminary tests on student's readiness to perceive learning materials.** It is necessary to work out a procedure of testing in order to be able to evaluate the level of student's knowledge. There exists a lot of tests of such kind but the specific character of this one is that it must give as a result a structured tree of gaps in student's knowledge. On its basis an educational course will be built, including all materials which student will need in the process of study. The result can be achieved in the case of modular structure of any educational course. Thus, we'll be able to assemble a course from blocks of information.

- **Adaptation of pace of studies (duration of lessons, content of new material in each lesson, etc.).** Here we also need a sort of a test in order to be able to evaluate the level of apprehension of information. Having these data it is possible to build educational courses with lower or higher percentage of new material in each section, with one or more repetitions of main ideas and concepts explained on a lesson. All this is possible to perform under condition that learning material should be presented in separate modules who can be operated independently from one another.

These features need a special protocol of exchange to be able to realize procedures of renewal, adaptation or dynamic construction. The second thing is that learning materials need to have determined structure, so the standard of learning course structure should be developed.

The task set needs collaboration in a wide scale with educational institutions and computer enterprises to achieve the goal. There is a huge amount of work to perform and we hope that from pieces of courses, computers and educational servers disposed in different parts of the world we will assemble a world's distant learning system offering a variety of possibilities where everyone will find something for himself.

Autobiographical Sketches

Elena Ossipova is a technical manager in Distant Learning Department of the North-Western Polytechnic Institute, Russia. She deals with distant learning projects since 1996. Also she worked under multimedia educational courses with a team of the skilled programmers in 1996-1997. At the moment she prepares thesis on the problem of optimization of informational resources in distant learning systems.

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Mexico's National Educational Videoconferencing Network

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Abstract

The Mexican network system for educational videoconference is described together with some major distance education projects in the country. Decision-making is emphasized, and analyzed in the Bates ACTIONS framework, to which a factor of self-correction is added. The main uses of the network are also shown.

Introduction

Interactive videoconference through compressed video has been expanding in Mexico in the last few years. A large part of the systems and networks are used for education and training.

UNAM, the National University of Mexico, has adopted videoconferencing for the last five years, as have some other public and private educational institutions. In 1997, the major networks were linked together into the National Educational Videoconference Network (Red Nacional de Videoconferencia para la Educación, RNVE).

In this paper, I will provide a succinct description of UNAM's capacities and its history of computing and networking, and build upon it a description of the RNVE. I will also provide an overview of the present usage of the most significant parts of the network.

The decision-making process which gave rise to building both UNAM's and the national networks will be described in the framework of the ACTIONS model of Bates,[1] and in the context of the availability and pricing of the system's components in Mexico. It should be highlighted from the start that in Mexico ISDN is not available, so that the main effort of the network is to provide switching service for the educational institutions' videoconferencing activities.

Near the end of the paper I propose to add a factor to the Bates model, a factor of self-correction which means that in distance education technology projects one should consider those technologies which facilitate the identification and possible correction of errors in contents or presentation instead of waiting for this to occur in later editions or releases of media.

It should be mentioned from the start that most of the activities supported by the network belong to type 3, "Independent study divisions of a conventional college or university," of Keegan.[2] Most of the paper is concerned with technology decisions and not with educational, pedagogic or other considerations, though they inform the decisions themselves and are mentioned in that context. Also, the technologies themselves are not described, as references are widely available.[3,4]

UNAM Networks

UNAM is the National University of Mexico, which is at the hub of the country's higher education system. This comprises 55 public universities, the National Polytechnic Institute (IPN) and approximately 130 Technical Institutes spread throughout the country. UNAM's student population is of 235,000, in which 120,000 high-school students are included. Many Mexican universities operate their own high schools.

Also, UNAM is a major research university covering most fields of knowledge, and is endowed with responsibilities which include holding several national collections, like the National Library, National Periodicals Collection, National Botanical Collection, etc. Its payroll is of 60,000, of which 10,000 are full-time academics.

The University operates facilities in all 32 federal states of Mexico and two in the United States, as well as one in Canada. It has more than 1,200 buildings, most of them in the main campus and other Greater Mexico City campuses. It therefore has had to develop a strong network for computers and telephones. At present 15,000 computers are hooked on tho the network; they include a Cray Y-MP and a 40-processor Origin 2000. The network's main campus backbone is the largest ATM implementation for education in Latin America.

UNAM is the institution which operated Latin America's first digital computer, in 1958. In the intervening 40 years, it has had to operate computers at a distance, at first through teletypes and dumb terminals, and growing to an up-to-date network. In 1989 UNAM adopted an all-TCP/IP approach for its networks, and Unix for nearly all of its main computers (a legacy system is still running and will be phased out in the next 12 months). This gave the institution an edge in using and ramping on to the Internet.

At present, the University operates approximately 1,500 kms of optical fiber on its own facilities, and rents capacity from the dominant telco in the country as well as from a few others. It has the largest Internet user base in the country, with 20,000 users in its central server and up to 80,000 universitywide, and 150 organizations downstream under cooperation agreements. The Internet is used strongly to support learning and teaching, and is intensively used in research.

UNAM has had an Open University subsystem since 1972, for a few of its courses of study. No telecommunications technology was introduced for the operation of this system until it began being reconsidered around 1994–5. At this time, the Open University Subsystem (SUA) started offering TV courses in some fields of continuing education.

In 1994–5 the then President of the University started a more aggressive Distance Education program. This was based on three basic technologies, television, the Internet and interactive videoconference, and supported, as it still does, a variety of educational approaches. The program in its origin emphasized continuing education and has now been extended to other educational levels and types. Its geographical distribution was to be supported through offices operated by the UNAM Alumni Associations, active in approximately 40 cities in Mexico. This proposition has grown very slowly, due to the insufficient funding structure of the associations.

Starting in 1997, the President of UNAM has formalized the instances for distance and open education, grouping them in the CUAED organization. CUAED is a normative organization, which promotes open, continuing and distance education projected from the schools and institutes of the University. The most active unit of CUAED in the production of distance education is PUEL, the Online University Program.

Our unit, DGSCA, is in charge of computing academic services and the operation of all UNAM networks. It operates the videoconference network described in this paper, as well as supporting all Internet operations of the university. DGSCA supports a Web site where a detailed, updated description of the network is described.[5]

Relevant Distance-Education Projects in Mexico

In this section I will describe some other distance education projects in Mexico, relevant to the present paper. They will provide context, and an opportunity to further explain the prevailing situation.

The Instituto Politécnico Nacional (IPN) is a federal institution, dedicated to higher education in more-technical fields of study. It is closely tied to Cinvestav, a major research institute with a wide choice of disciplines. IPN has several centers located throughout the country, with a varying combination of basic and applied research, and some level of teaching mostly in continuing education.

IPN operates an open-television channel, Canal 11, in Mexico City, which is rebroadcast in some other cities. Canal 11 is a cultural and public-service channel, not unlike the US's PBS in outlook and programming, which has some contribution to distance education but has a strong policy not to participate directly in educational projects. This channel gives IPN a great capacity in television production in general.

IPN has established its own videoconference network in approximately 20 classrooms. About half of these are in Mexico City and the others in the IPN centers in the country. They are connected among themselves mostly with 256 kbps links, most of which are microwave. The network has a star topology, with a single multipoint unit in Mexico City. The distance-education project itself comprises mostly continuing education and in fact the whole system is operated by the Continuing Education Directorate.

An important difference between this network and the one of UNAM should be highlighted at this point. IPN operates its own facilities in the country, whereas the network of VC classrooms connected to UNAM is a mixture of its own facilities (in the cities of Querétaro, Cuernavaca, as well as San Antonio, Texas, Hull, Quebec, and the ones in process in Ensenada and Morelia) and of allied institutions (universities in the states of Veracruz, Colima, Nuevo León, Quintana Roo, Chihuahua, Sonora, Sinaloa, Durango, and others). Thus IPN can operate its network under its own full authority whereas UNAM has some classrooms under full control and the others are operated on an interinstitutional cooperation basis.

Another important difference is that the UNAM network has a point of presence in the United States (in San Antonio, Texas). There, it operates a multipoint unit whose ISDN capabilities allow it to connect to networks the whole world over, and it actively uses three different classrooms.

The National Distance Education Program is operated by the Secretary (Ministry) of Education, SEP, and has as its basic tools the Red Edusat (Edusat Network), Red Escolar (School Network), and a videoconference linkage.

Edusat is a satellite TV network, further broadcast by open television and cable in some cities. Its most important and long-standing project is Telesecundaria (Tele-JuniorHigh), which has operated for more than 30 years with significant success. It has access to 14,000 schools throughout the country. Its model combines F2F activities with remote input through specially designed and produced TV programming. Part of its contents is also used in some countries in Central America.

The Red Escolar (School Network) project is run for the Secretary of Education by ILCE, a multinational institution under contract to the Mexican federal government for this and other projects. Red Escolar is a complex, emerging network, which will eventually give access to the Internet to up to 130,000 schools.

Red Escolar operates on a mixed, layered platform. Some schools, which are properly connected through permanent data links, have full access to the Internet. Some others operate through modems and telephone lines. Finally, a large number of schools will only have access to Internet contents broadcast to them by satellite, in a down-only link to a combination TV decoder-modem. This layer structure is required due to the weakness and unevenness of telephone coverage in the country. Mexico has approximately 11 telephone lines per 100 inhabitants, and actual coverage ranges from 22 in Mexico City to 4 in Chiapas.

Red Escolar is now past the pilot stage and has already achieved remarkable success in the few hundred schools now operating. It has introduced varied teaching methodologies to make use of computers and networks. It is mostly collaborative learning, with either a Learning Circles approach or large, cooperative projects like the study of butterfly migrations over large territories. In this case, the collaboration of students took place not only in Mexico but also comprised children in the US and Canada.

Red Escolar faces great challenges and is bound to achieve well in most or all of them. It attracts support from teachers, families and decision-makers in the federal states of Mexico, so that it is able to find some financing to add to the one it has in the federal government.

Several federal states in Mexico have, or have had, other distance education projects with significant success. Among these are Veracruz's TeleBachillerato (TeleHighSchool), and computer network projects in the states of Nuevo León, Tlaxcala, Aguascalientes, Guanajuato and others. These last ones are more oriented to the use of the Internet and grow upon previous projects which have brought computers and networks into the classroom in a successful way.

As a result of this work, a large number of educators and decision makers in Mexico are committed to the use of IT in education, and to a set of varying models for distance education. Among others, videoconferencing has become extremely attractive for those projects where synchronous, person-to-person interaction adds particular value, as happens in our country in continuing education, graduate seminars, teacher training, and related types of work.

A separate analysis must be made of the distance-education projects of the Instituto Tecnológico y de Estudios Superiores de Monterrey, ITESM, more popularly known as Monterrey Tech. This private institution has also a high-school system as well as undergraduate and graduate schools. It operates in 26 campuses with a total of around 80,000 students. Decision making is centralized, residing mostly in the original city of ITESM, Monterrey.

ITESM has had a succession of distance education projects. It started with a satellite television system, with proprietary encoding, directed to all 26 campuses and with uplink capability in four of them. In its first incarnation it was aimed at the graduate education of ITESM professors, who were in a rapid process of obtaining graduate degrees as a part of ITESM's accreditation process before United States accrediting bodies. Then, it was aimed also at undergraduate students and lectures were delivered over this system for semester-long courses. The interaction beteween students in different sites, and between students and their teachers, was limited, supported as it was by the asymmetric links of telephone, fax and electronic mail.

ITESM then created its Virtual University, a combination of television and mostly Internet tools for teaching, which in its first stages concentrated in graduate courses in education, still directed mostly at its own teachers but already open to a more general population, and in continuing education and certificate courses. The ITESM Virtual University has students in several places abroad, particularly Central and South America.

In the upcoming months, ITESM will start operating its online education project. In it, each student will be required to use a portable (notebook) computer to access lecture material, exercises, homework, discussions, etc. A large number of network nodes is being installed in ITESM facilities, in order for students to have continuing access to these materials. The whole system will be supported by a Lotus Notes and Learning Space Infrastructure. In the order of 80 Notes servers, running Windows NT, are in operation.

The Notes implementation holds 30,000 users at present. One of the stated purposes of this use of technology is to allow some teachers to work with up to 400 students in a distributed class. The way this is expected to work is through collaborative learning, which is expected to ease the teacher's workload by substituting with peer discussions among students.

A videoconference network is being installed by ITESM as a complement to these efforts, and is available on demand for collaboration projects with other institutions, by ISDN calls through the United States.

The National Educational Videoconference Network

The National Educational Videoconference Network in Mexico was formed essentially by uniting the networks centered in UNAM and IPN, as well as those connected to either institution, and operating them cooperatively.

UNAM has its classrooms in several points in Greater Mexico City, in Querétaro, Cuernavaca, and San Antonio Texas. Facilities will soon operate in Morelia, Ensenada and Hemosillo. Its multipoint units in Mexico City are connected to IPN's one also in Mexico City through an E1 fiber-optic linkage rented from the Telmex telephone company.

IPN has facilities also in several points of Mexico City, as well as the cities of Tijuana, Tampico, Reynosa, Culiacán, Morelia, Guadalajara, Oaxaca, Cancún and Mérida. The facility in Reynosa is operated cooperatively with the Mexican Petroleum Institute (IMP).

Both UNAM and IPN are connected to the networks operated by the national oil company, PEMEX, and IMP. The connection again is established to the multipoint units of these two networks in Mexico City. PEMEX and IMP operate videoconference facilities in Mexico City, Salamanca, Poza Rica, Minatitlán, Coatzacoalcos, Villahermosa and Ciudad del Carmen. Most of these facilities are associated with the oil industry in the Gulf of Mexico coastal region. They are both meeting rooms and classrooms; it should be noted that IMP is the largest professional training organization in the country.

UNAM's network reaches further out into the country through its alliances. These are with:

- Red del Noroeste (Northwest Network): multipoint in Ciudad Juárez, facilities in Ciudad Juárez, Chihuahua, Hermosillo, Ciudad Obregón, Durango, La Paz and two rooms in Sinaloa. There is a cross-border link to El Paso, operated through ISDN on demand.

- Universidad Veracruzana: multipoint in Xalapa, facilities in Xalapa, Poza Rica, Veracruz, Córdoba-Orizaba, and Coatzacoalcos.

- Universidad de Colima: single facility in Colima.

- Universidad de Quintana Roo: single facility in Chetumal (in the network, this is the only satellite link, operating at 112 Kbps).

- Universidad de Nuevo León: multipoint and three facilities in Monterrey.

- Universidad Autónoma de Tamaulipas: multipoint in Ciudad Victoria, facilities in Ciudad Victoria, Tampico, Reynosa, Ciudad Mante, Nuevo Laredo and Matamoros. It has a cross-border link, ISDN, to Edinburgh, Texas.

The institutions in the network operate their videoconferencing systems at transmission rates of 256, 384, 768 and 2,048 Kbps. The multipoint units are programmed accordingly for each event. In some cases, and starting in 1998, we have been operating a multipoint unit which can handle different bit rates in a single event, thus making access easier and the events more attractive.

The educational projects supported by the network are varied, according not only to the participating institutions but also to each of their subunits as well as to third-party projects. Consequently, a variety of educational approaches are supported, from traditional lectures to collaborative learning.

The responsibility for the contents, quality, assessment and certification in each educational project belong to the "owning" or generating institution and subunit. The operators of the network act only in recommending solutions to each of these problems. They also are proactive in attracting participants and in training lecturers, teaching assistants and students in the use of videoconferencing, and in its combination with other techniques for distant education and distant learning.

Decision-Making Analysis

The decision-making process which gave birth to the videoconferencing system in Mexico can be analyzed in several different frameworks. For the purposes of this paper, the ACTIONS approach of Bates (ref.1) has been appropriate. In the rest of this section specific reasoning behind the establishing of the network will be discussed in this framework, which will at the same time be used to consider the alternatives considered along the process, and which in many cases coexist and are also used in educational projects.

The reader should recall that the approach of Bates uses ACTIONS as an acronym for Access, Cost structure, Teaching and Learning, Interactivity, Organization, Novelty and Speed of development and deployment. Each of this factors is considered, according to the actual or projected needs and resources for specific instances of technology implementation of distance education.

Access

Access has been a primary consideration in distance-education projects in Mexico. For many years, in fact, it has been dominant, particularly in the K–12 levels. As a result, some of the longest-standing projects are TV based. The prime example, which has already been mentioned in this paper, is the Telesecundaria (TeleJuniorHigh). In Telesecundaria, grades 7–9 are taught in rural and barrio settings, in single-class schools where all grades attend the same classroom at the same time. Television input is combined with hands-on exercises, face-to-face lectures, explanations and discussions, and other teacher-led activities, with all three grades taking turns.

The Edusat satellite television broadcast system, using Mexican geostationary satellites, provides the up- and downlinks of Telesecundaria and other training programs, and is available part-time for other educational projects. In particular, UNAM has been broadcasting continuing-education courses for some years now. The experience is good, with small groups in a few cities in the country. Each course has an attendance of a few dozen students. Although television has been chosen for its easy, cheap, and widespread access, it has not brought in as many students as the access factor alone would make possible. Besides access to receivers being cheap, the satellite link is available at no cost for this project since, as described elsewhere in this paper, the Edusat network is federally operated and subsidized.

The VC networks were established in spite of the fact that this technology qualifies low in respect to access, since students have to actually attend a physical facility and there are comparatively few of these. However, for the educational projects using VC in Mexico, access is a less-significant factor, since, due to their content and educational level, they are directed more to urban, educated populations which can manage with minor effort to access the VC classrooms in their cities.

The third major technology considered in this paper, the Internet, had a relatively low accessibility five years ago, and was considered as complementary. At the time, access to the Internet was mainly possible in higher-education campuses, and in that sense was not dramatically better than other alternatives. At present, there are some 400,000 Internet users in Mexico, many of them away from educational institutions, and the access equation begins to favor the Internet. Not surprisingly, online education projects are arising.

Cost Structure

Cost, and more emphatically cost structure, is a very significant factor in the reality of distance-education work. In the case of the networks under discussion in this paper, it is of course an important, though not dominating, one.

With collaborators along time, I have done a cost structure analysis for technologies for education in several projects. We[6] have added emphasis to the Bates model in that the cost structure analysis must consider separately the costs to the emitter and to the receiver before any decision is made related to technology adoption for distance-education.

For the case in point, the cost structures of television, videoconference and the Internet are considered.

Fixed costs for the emmitter in television are by far the largest figure. Setting up and operating a television emmitter is extremely expensive. In the Edusat network already mentioned, this is factored out of the equation by the fact that it is government-operated. The federal government owned the satellites used in this project, until 1997 when they were privatized. However, by law, the government still has free use of some of the transponders, among others for educational purposes (I strongly believe that this is a law with positive effects, a simile of which should be adopted at least in developing countries). Therefore the expense of using the scarce good which is a band in the electromagnetic spectrum over the country is already paid.

Educational projects using TV in these conditions still have steep operational costs for producing their programs. However, in cases as Telesecundaria, the cost is well justified given that it is a federal expense, and it is spread out to at least 14,000 schools and at least an order of magnitude more students. Of course, the factor that makes television a particularly attractive technology in projects which reach out to a geographically disperse, economically challenged population, is that the cost to the receiver is near zero.

In contrast, the cost to the receiving station in VC is high, both in investment and in recurring expenses. In Mexico this is particularly acute since the digital data links required to operate are expensive (an E1 link reaching out more than 600 km can cost 120,000 USD in its first year, and 100,000 USD/yr afterwards). The cost of these links is partially well justified, in that if they are properly configured and used they can also carry data and voice traffic. In fact, only 4 to 6 E0s (256 to 384 Kbps) are fractioned for VC activity, in the most usual setup.

Further in this cost analysis, the receiving station in VC is such one only in some of the projects for which it is used. For other projects it becomes the emmitter. This balances out the cost structure equations pretty neatly, especially for undergraduate, graduate, and continuing education. It will be seen further on in the paper that the disadvantages brought by the cost structure are compensated by the increased success of VC DE processes due to their improved interactivity and other factors.

Finally, the cost structure of the Internet should be also mentioned. In Mexico, this cost structure is gradually approaching that of the United States. This means that both emmitter and receiver costs, be they fixed or current, are way below those of VC. In fact, increasingly the Internet is used as a part of VC-based DE projects, and a wide body of experience has accrued in the management and use of electronic discussions and other online resources.

Teaching and Learning

This is the what and the what for of DE projects. It should come first on any list of decision factors, and it is only the simplicity of the acronym that sets it here.

In the VC network in Mexico, a variety of educational approaches are used, as decided by the originators and participants in different projects. However, most of them are geared to those teaching and learning that are particularly facilitated by vivid dialogue among adults, and therefore concentrate mostly in postsecondary education.

This factor alone has been crucial in the success of VC as compared to television in this educational level.

Interactivity

Interactivity is a controversial factor in distance education. Schools of thought as well as bodies of experiment stand at odds in discussing its importance and effect. The most successful of the courses and academic activities held in our network add to Bates' statement that "learners need to interact both with the learning material, and with tutors and instructors, and other students, in order to learn effectively."

The VC network adds to TV an interactivity among participants which goes a long way in delivering the full value of face-to-face interaction, synchronously and with all the metaverbal components short of actual touch. This may be further understood in the taxonomy of Aleem.[7] It adds this value to computer-mediated-communications (CMC), although these partially compensate by their asynchronicity, which is useful in other contexts within DE projects, and by the precision of the communications for which they allow when they are well written and use precise quotation either from sources or from the participants statements.

It would seem, though this is still open for quantitative study, that the differences in interpersonal relations observed in Mexico as compared to the United States favor VC in contrast to television and CMC. This arises from a higher need of trust, of more closely knit relationships, than are observed in business practice and in education in both countries. This would bias the interactivity discussion, in our culture, in favor of more person-to-person interaction and less in favor of either written communication, person-to-learning-material, or independent, personal, individual, distributed and isolated study.

Organization

The organization for distance learning and distance education in Mexico has complexities of its own. The rules and bylaws of educational institutions may be firmly anchored in conventions, as they are in many other countries. However there is much less trust in the system as compared to the rest of North America. Therefore, issues such as student assessment, grading and certification rise high. Enrolment is a major issue in Mexico for undergraduate education, since there is strong competition for admissions; therefore most projects are aimed either to registered students of each institution, or to continuing education or extension where admissions are more flexible.

The way we have been using the VC network has a very practical approach to organization. The Network itself is seen as a medium only. Each institution and subunit makes many of its own decisions in this regard. Thus, some are detailed and strict in the student authentication process, and either have staff of their own or allied institutions identify the students. Other rely more on trust and eventually the possibility of having witnesses testify should an auditing process ensue, and have actually performed graduate degree examinations through the VC system as happened recently in a connection between Mazatlán (where a temporary VC room was established) and Mexico City.

This lightweight approach for the network itself supports UNAM's CUAED as a promoting and norm-emitting body, as well as IPN's DEC organization for continuing education, in a frictionless fashion. It equally accommodates other institutions. The combination with other media and technologies, as well as support by other services like libraries or publications, are also decided upon by the participating institutions. The agreements among them can reach all the way to cross-accreditation. Of course, the distance-education organization itself is more complex than the Network's, which is based on cooperation agreements among peers to operate, route and switch, and is continually evolving as it grows and is formalized.

Novelty

The novelty factor has played in favor of VC in many cases, though it still brings out resistance and mistrust by academics in the country. Many professors and teachers are immediately convinced of the possibilities of VC through its vivid, powerful interaction capability which is unseen to many of them. In contrast, the novelty factor plays against television, of which many academics are wary as they consider (rightly or not) that students will have a passive attitude before it, and also because of failed experiments in educational television in Mexico which took place in 1975–1977.

We have documented the value of the novelty effect in interviews and field observations. It also applies to the Internet. However, many teachers are wary of using it immediately for a factor to be described in the next subsection.

Speed

The speed with which one is able to develop and start operating a distance education project may be decisive in many contexts. Continuing education provides a good example in this sense, since new subject matter and even full sets of certificate courses may need be provided in short notice and with continual updating.

This factor plays against recorded, professionally produced video and TV broadcasts, as well as against some uses of the Internet, particularly interactive courses over the Web. Both sets of products require a long, thoughtful process to produce rich media, and are relatively inflexible in face of the need for updating.

In contrast, live television broadcasts and videoconferencing may take little to no time for deployment, if their participants already have the prerequisite preparation. In cases of urgency (response to an epidemic or epizootic, of which we have had a striking instance in Mexico in 1995), a TV broadcast can be prepared within days, notice given to the specialists interested in most of the country, and an actual educational broadcast take place with dramatic effect (on the incidence of avian influenza, in the case in point).

"Factor Eight": Self-Correction

This speed of development, the synchronicity of the interaction between specialists or stakeholders in a given project, and the symmetry of the videoconference system, give it what I would almost propose to be Factor 8, Self-correction. Recorded video, recorded audio, CD-ROMs, why, even books, share one defect: they are not self-correcting. A mistake, error, misconception, wrong programming, defective imaging, etc., once recorded, may stay forever. The cost of updating these media, such as making a new edition of a book or a new release of software, may be prohibitive, and even then, upgrades and updates may never be incorporated into copies that are already in use.

However, live interaction with specialists or other knowledgeable, attentive persons allows for errors or inconsistencies to be noticed and pointed immediately, all the more so if a symmetric interaction medium flattens the social bias of the interaction. With some luck, the deficiency may be corrected in the same event, either by the lecturer or equivalent, or by other members of the audience; otherwise, it will be noted by all participants and corrected off-line or in the next event in a series.

It should be noted, though without further expansion here, that evaluation and assessment, both of courses and of learning in individual students, are coupled with the self-correction factor.[8]

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Online Learning:
Does Bloom's Taxonomy Have Relevance?

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In creating an online campus, administrators and faculty members can often become focused only on the technology and the faculty pedagogical shifts needed for distance course delivery. With the newness of the delivery platforms, along with faculty training issues and multimedia integration, it is easy to get caught up in the frenzy and loose sight of basic educational issues. Learning how to rebuild an online course is no easy task, for many faculty members it is perhaps deja vue to their student teaching days. What is very often overlooked in this new medium is how to balance and/or separate the academic issues from the technology issues. An easy trap in distance education is to blame the "technology" when students are challenged to "learn how to learn" for the first time in their academic careers.

Of course, in a perfect world, all of the students enrolled in distance education would be highly motivated, self-disciplined, on-time individuals who accept their role as active learners from the day they go online. In reality, we find the same diversity of skills and talents (and motivation) for online classes as we find in our traditional classrooms. We are comfortable with this diversity in the face to face experience because we have developed adaptive skills—both on the part of the instructor and the student. Too often in the distance format many of the excuses for the failure of students to succeed online are blamed on the technology, with little consideration given to the format and learning objectives/activities in the course.

The idea to use a learning style questionnaire for online students came about quite serendipitously. In working with a publishing house (John Wiley and Sons) an interactive CD-ROM product for a potential online class was reviewed. On this CD was a learning styles questionnaire, along with tools and strategies for how students could use the different features of the text to improve their learning process.

Research in learning styles is not new. Since the 1890s, researchers have been studying the impact of teachers' characteristics and styles on their students' progress. What was different about the learning styles inventory questionnaire on the CD was that it focused on the student's learning as much as the cognitive factors identified by Bloom. Just as a map provides many roads to the same destination, so too do different learning styles provide different paths to Bloom's levels of cognition. Students may use one or more learning style, therefore it is quite impossible for teachers (whether F2F or online) to confront the diversity of their students in the learning process.

The learning styles diagnostic tool, used by Wiley, was that of Fleming (1992). This research started with Sterling's (1987) categories of learning—visual, aural, and kinesthetic. To these he added a fourth: Visual (V) preference for graphic and symbols; Read/write (R) preferences for printed information; Aural (A) "heard" information; and Kinesthetic (K) a problem-based method in which students learn theory through its application. The tool itself is quite simple, containing only 13 items drawn from real world examples. The questions have both "presenting" as well as "processing" information.

This questionnaire has been completed in the online setting with over 250 graduate management students.

The next step in the research will begin this fall, as the questionnaire becomes part of a longitudinal study of cohorts of online graduate management students, both domestic and international. All students will be required to complete the questionnaire as part of their Introductory Online Orientation. The questionnaire will be scored electronically and students will receive an automatic electronic response with their score, as well as a list of tools to assist them in adjusting/adapting their learning strategies. These results will then become the basis for the student's initial online team activity.

Through threaded discussion and teamwork, we will be able to replicate online the discussion model in the original research. These discussions will focus on the way information is presented online; how to take notes for online study; how to participate in group problem-solving activities; and strategies for assessment tasks.

Likewise, all faculty members will participate in taking the same questionnaire as well as examining how they construct and present their online course materials. The same online facilitator will lead both the students and the faculty members through these activities. The facilitator will share, with the faculty member, the anonymous results of the section of students s/he will be teaching. All of this should result in the heightened sensitivity of both the faculty and students to the diversity of the class. In completing these activities in the collaborative online platform (kinesthetic learning) it is hoped that both students and faculty will have a collective understanding of the new distance platform, thus maximizing the long-term success of the class.

Implications for Distance Education

The active learning platforms of the new online courses requires the academy to move from "faculty-centered" to "student-centered" learning. This simple learning styles tool combines elements of both, in a format that provides practical, diagnostic information for both the student and the teacher. Gathering such baseline data for a planned longitudinal study will provide much needed insight into how students learn and faculty teaches online over time. Of course technology will always be providing new "bells and whistles" but it is still the inputs and the outcomes that must drive the education process. The role of technology is to provide a seamless platform for learning, not to be the scapegoat for poor teaching and learning.

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Autobiographical Sketches

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Improving Audio Quality in Distance Learning Applications

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Introduction

If you're like most educators, distance learning represents a fun and interesting challenge for you. The logistics of dealing with multiple locations and the problem of keeping everyone interested in your topic are your main concerns. And, if the distance learning network is designed correctly, they should be your *only* concerns.

The problem is that in a large number of distance learning networks, careful attention is paid to the video side—camera locations, position of the lighting, ability to view monitors, etc.—but little attention is paid to the audio, which carries the bulk of your message (unless you're conducting a final exam on sign language or lip reading!). Does your distance learning network have any of these problems?

- "Bottom of the barrel" sound (the rooms sound hollow and "boomy")
- Feedback/squealing in the PA system
- Feedback/squealing whenever you bring a phone line into the conference
- Voices are distorted or garbled (difficult to hear or understand participants)
- Fans or blowers overpower voices
- Some voices are too faint, others too loud
- Background noise is really annoying
- Acoustic echo (you hear your own voice coming back to you, or your students hear their own voices coming back to them)
- Satellite networks: your students hear their voices coming back to them over the satellite, with a long delay
- Telephone networks: the audio is thin, tinny, difficult to listen to for long periods of time

You do not have to put up with bad audio in your distance learning network!

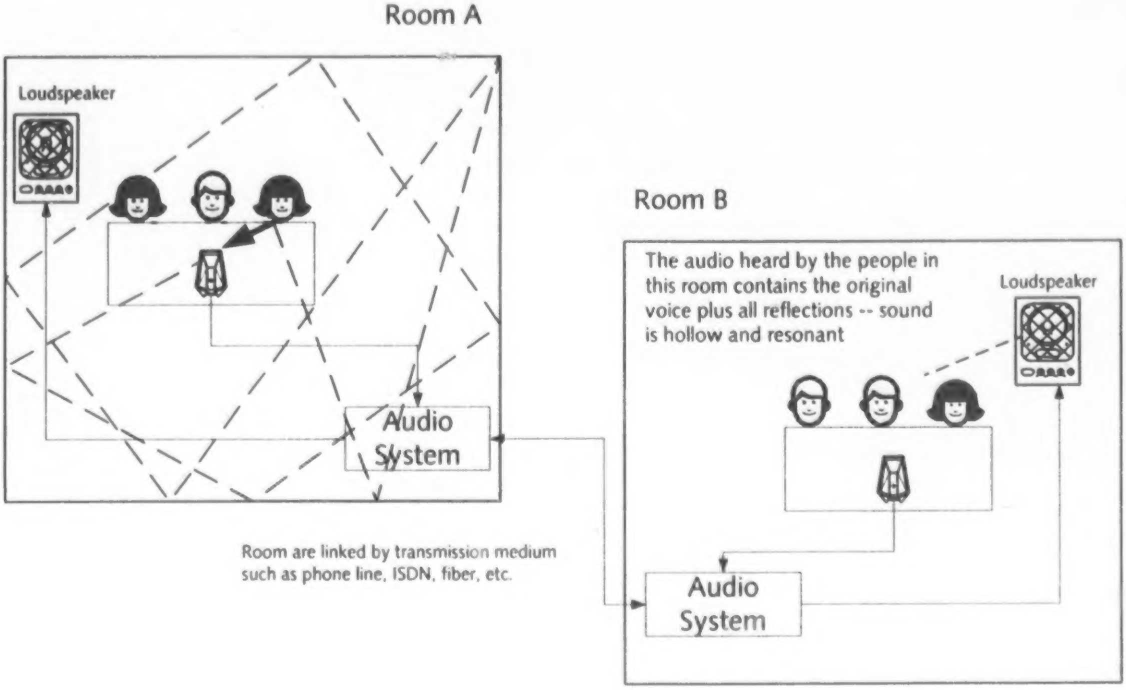
This paper will discuss the most common causes of the problems encountered with audio systems, and practical suggestions for correcting the problems.

It's (Almost) All in the Acoustics

Here is a bold (but true) statement: *Most audio problems in your distance learning network are caused by poor acoustics in the classrooms.*

With only a few exceptions, the majority of your problems can be traced to the hard surfaces you'll find in the classroom—walls, floors, ceiling, windows, and tables. A room with lots of parallel hard surfaces is said to be highly *reverberant*, meaning a sound introduced into the room will bounce around for some time before decaying beyond your ability to hear it (see Figure 1).

"But," you say, "we've had reverberant classrooms ever since schoolhouses were first designed. What makes them a problem in distance learning?"



The audio heard by the people in this room contains the original voice plus all reflections -- sound is hollow and resonant

Room are linked by transmission medium such as phone line, ISDN, fiber, etc.

Figure 1: Reverberation and its effects on transmitted audio.

Reverberant classrooms only cause minor problems for the people in them (the biggest problem being fatigue) because the position of our ears, combined with the processing power of our brains, permit us to ignore the bouncing audio and concentrate on the source of the original sound (hopefully, the teacher). In other words, we hear three-dimensionally. A microphone, on the other hand, simply picks up everything it "hears" and sends it to the other classrooms. The original sound is given the same treatment as a reflection of the sound because the microphone cannot differentiate between the two. The students at the other sites do not have the benefit of 3-D hearing because ALL sounds are reaching them from a single location (the loudspeaker). The result is that the students in the distant locations hear everything—original audio plus reflections—at one level (the loudspeaker's volume) which gives them distorted, garbled sound.

There are a number of "fixes" for reverberant rooms. The best "fix" is acoustic treatment: acoustical ceiling tiles, carpeted floors, sound-absorbing panels on the walls, and draperies over the windows. If you don't have the budget for sound panels, carpets or draperies, try tacking a few blankets to the walls and tossing some throw rugs on the floor. You'll be surprised how much "quieter" the room gets. You should invest in draperies no matter what else you do: they will dampen sound, and your video will look better without interference from sunlight.

There are also a couple of electronic "fixes" that could help:

- An automatic (or "gated") microphone mixer reduces the number of times reflected audio can reach a microphone by turning idle mics off (the mixer must have a "threshold" setting that sets the "on" level above the level of the reflected sounds). Even if you have acoustic treatment in the room, you may want an automatic mixer to keep background noise at a minimum. Automatic mixers will be discussed in more detail below.

- Microphone processors can distinguish between the original voice level appearing at a microphone and lower-level reflections, and adapt to prevent the lower level audio from being passed through the system. Mic processors can also remove background noise from the audio. (However, you must have a processor for EACH microphone in the room, which can get expensive.)

Correct Microphone Usage (or Why Don't We Sound as Good as the People on TV?)

Television has given us an inaccurate impression of how "teleconference" audio should sound:

- In the TV world, people in another room (or even hundreds of light years away) sound great, and no microphones are seen anywhere.

- On the evening news or the nighttime talk show monologue, the announcer sounds terrific, and he or she is not holding a microphone.

The answer to the first example is easy: *it's fiction!* The second example simply reflects good camera angles concealing a boom microphone . . . or if you look closely at the announcer, he or she may be wearing a lapel (lavaliere) microphone. In television, great care is taken to conceal microphones because the sight of them would distract from the desired appearance of the sets and actors. However, microphones *are* present, and there are a lot of them in use.

Another important concept: sound is carefully controlled in TV studios. Walls are non-parallel, sound stages are acoustically treated, heavy drapes surround sets (both to minimize reverberation and cut down on background noise) and a number of microphones are placed in strategic locations for the best pick-up of sounds. Television studios also use highly directional microphones to pick up only the desired sounds while blocking out extraneous noise.

It probably isn't practical to convert your classroom to a television studio, but you can incorporate certain aspects of one, especially when it comes to microphone usage.

- Make sure you have an adequate number of microphones in the room. If you don't have enough microphones, it will be difficult to hear everyone (some people will sound faint and far-off while others are loud). If you have too many microphones, however, background noise can become overpowering and it's easier for the room to break into feedback. A good guideline is to have one microphone per 2 to 3 students (an automatic mixer can also help: see below).

- Get microphones off desks and tables, but not too far away from the people! Low-profile "boundary" microphones that sit on a tabletop are attractive and work well for a corporate conference room, but in the paper-laden classroom, these microphones are bound to get covered (or rustling papers will be louder than the students' voices). Podium (or "gooseneck") microphones are best: these microphones involve a small stand mounted to the desk, and a flexible "neck" with a small microphone positioned about a foot above the table. Another option is to suspend microphones from the ceiling, with the mics "pointed" at the students. If you do this, make sure students don't have to look up in order to talk into the microphone; position the microphones a couple feet above and *in front* of the desks. Microphones that are flush-mounted on the ceiling *can* work, but also create problems by being too far away from the students (when a microphone is more than a couple feet away from the mouth, the "bottom of the barrel" effect kicks in). Another problem with flush-mounted ceiling microphones is the possibility of 'mechanical coupling,' where the mics pick up vibrations from the air handling system, loudspeakers, or people walking on the floor above you.

- If your classroom has more than four microphones (and it should unless it's a small class), it's recommended to use an automatic microphone mixer. When a large number of microphones are on at once, especially in a reverberant room such as a classroom, the room's "gain" into the audio system can become too high. This excessive gain results in squealing or howling (feedback). Also, as mentioned earlier, an excessive number of "on" mics will increase background noise in the audio system. The automatic mixer will ensure that a minimum number of microphones are "on" at once. Experts in the field recommend an automatic mixer if four or more microphones are used in a room.

  Look for an automatic microphone mixer that will:

  - be able to handle the number of microphones you will be using (most mixers are "expandable" or can be cascaded).
  - not require a specific type of microphone—this can prove costly.
  - provide an "automatic gating threshold"—this means that a microphone will only turn "on" when the sound level exceeds a pre-determined level. The smarter mixers can automatically set the gating threshold above the background noise.
  - permit a "chair override" on one of the channels. This permits the instructor to take control of the mixer by simply speaking into his or her microphone.
  - allow one microphone to be "always on." If all mics turn off, that room's audio will go away (including background noise), making it sound as though the connection were cut off. Leaving one microphone on will provide a more natural sound (and is essential for the proper operation of acoustic echo cancellers, which will be discussed below).

Correct Loudspeaker Usage

A common mistake in distance learning or teleconferencing classrooms is the tendency to use only one or two loudspeakers to carry the audio from the other class sites. This can result in the following problems:

- When too few loudspeakers are used, it's necessary to crank up the volume, which places the room closer to a "feedback point."
- The students near the loudspeakers are in pain from the volume, while students who are far away from them can barely hear what's going on.

Using an adequate number of loudspeakers will allow you to keep volume at a reasonable level throughout, and will minimize the amount of loudspeaker audio that is picked up by microphones. The best way to distribute loudspeakers is to place them in the ceiling (or mount them along the walls) and control them with a separate power amplifier. The better amplification systems permit "zoning" of the loudspeakers, which is useful in lecture halls for amplifying the instructor's voice along with the audio from other sites. Keep the loudspeakers directly above the instructor at a lower volume to prevent feedback via the instructor's microphone.

One final note on loudspeaker placement: try to isolate loudspeakers from microphones as much as possible. Remember that a microphone will pick up all sounds in its vicinity, and audio coming out of a speaker will be treated as just another voice in the room.

Acoustic Echo (or Why Am I Hearing Myself? This Is Really Annoying!)

Anytime two or more sites talk to each other with "open" microphones and loudspeakers, the potential exists for acoustic echo. Acoustic echo is caused whenever a site's microphones pick up received audio off loudspeakers and re-transmit the audio back to the originating site (see Figure 2).

The pick-up path of the audio can be direct (straight line from loudspeaker to microphones) or indirect (bouncing around the room, then hitting the mics). Depending on the size of the room, or how reverberant the room is (reverberant rooms bounce the audio around for quite a while), a certain amount of delay will occur between the time the audio appears on the loudspeakers and when it reaches the microphones. This "room delay," combined with any delays introduced by the transmission path, will result in a delayed echo that could rival deep canyons or baseball stadiums. Unless you're a professional sports announcer, you can become extremely unnerved by this delayed repetition of your voice.

Fortunately, it's easy to fix acoustic echo! All it takes is a product called an acoustic echo canceller (AEC). The AEC is a bi-directional device which is placed into a room's sound system between the microphone mixer and transmission system, and the receive port and loudspeaker system (see Figure 3).

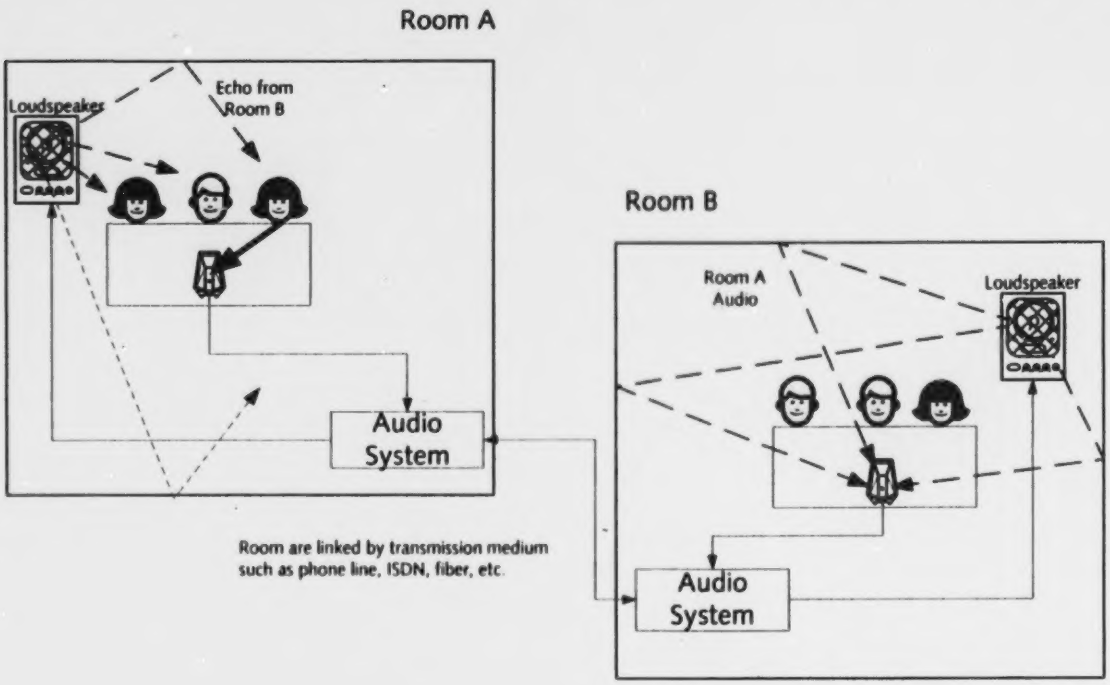

Room A
Loudspeaker
Echo from Room B
Audio System
Room B
Room A Audio
Loudspeaker
Audio System
Room are linked by transmission medium such as phone line, ISDN, fiber, etc.

Figure 2: Acoustic coupling generated by an open microphone and speaker.

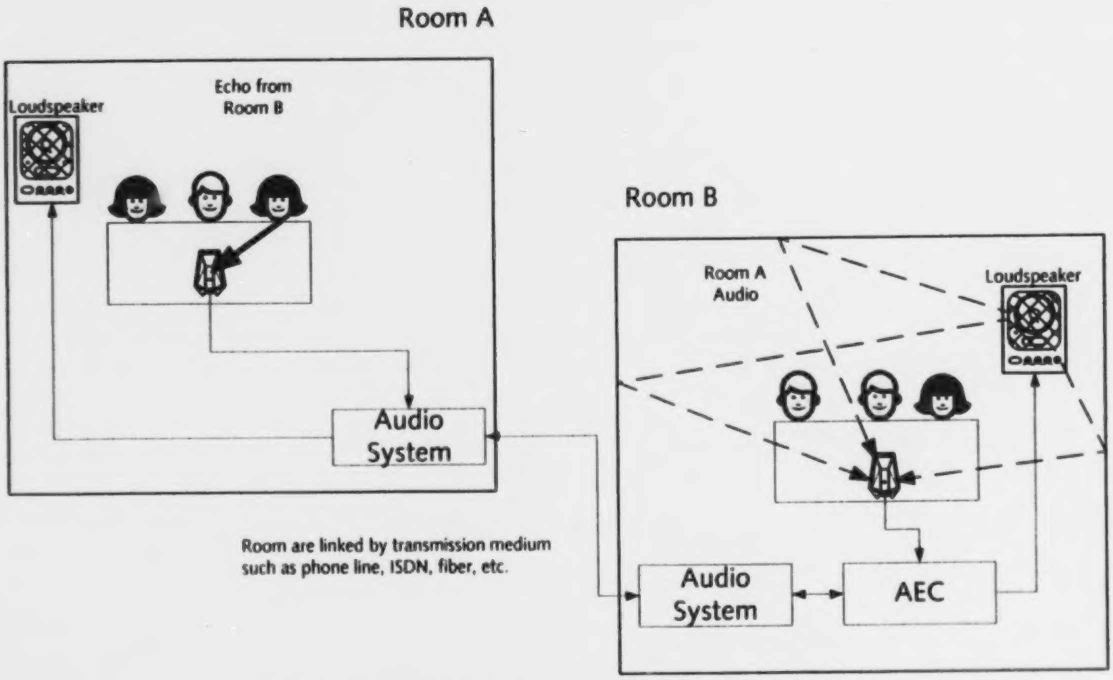

Room A
Loudspeaker
Echo from Room B
Audio System
Room B
Room A Audio
Loudspeaker
Audio System
AEC
Room are linked by transmission medium such as phone line, ISDN, fiber, etc.

Figure 3: The AEC solution in Room B removes echoes from being transmitted back to Room A.

Acoustic echo cancellers use digital signal processing (DSP) technology to compare received audio with the audio being sent back down the transmission system. Any audio that has the same characteristics as the received audio is removed from the transmitted signal. Recent advancements in AEC technology have made these devices very effective in removing both "real-time" and delayed echoes.

An important note: an AEC in your room will do nothing to keep you from hearing the return of your own voice, because an AEC benefits the OTHER site(s) by removing their audio from the audio being sent to them. In order to eliminate acoustic echo at all sites, you will need to place an AEC at each location in the distance learning network.

Outside Problems (Noise That Isn't Part of the Sound System)

One of the most distracting things in a distance learning network is the extraneous noise that is picked up by microphones and sent to the other sites. This noise can take several forms:

- Blowers and other air handling systems
- Fans on computers, overhead projectors, etc.
- Buzz from fluorescent lighting
- Noises coming into the room from outside (talking, vacuum cleaners, traffic noise, etc.)
- Papers shuffling/rattling in front of microphones

Some of these problems aren't fixed easily. You may need to get the building contractor to install quieter air handling systems or have an electrical contractor change the lighting system. Computer/projector fan sounds and paper noises can be alleviated through correct microphone placement (see above). As for noises coming in from the hallway, one suggestion is to buy an "ON AIR—QUIET PLEASE" light and install it next to the classroom door in the hallway. (If your integrator does not have one of these lights, it can be purchased through a broadcast equipment dealer.) Traffic noises can be dampened somewhat with heavy curtains and other acoustic treatment (see above).

Sound System Problems (Squealing/Howling)

When a sound system starts squealing or howling, it is said to be in a feedback state. Feedback is caused by either an electronic or acoustic signal "feeding back" to its source, becoming amplified, and going through the cycle again.

- Electronic feedback is caused when an "output" signal is erroneously routed back to the sound system's input. This can also be caused by improperly adjusted telephone equipment (see below).

- Acoustic feedback is caused by having microphones too close to the loudspeakers that carry the microphone audio (local sound reinforcement).

Telephone System Feedback Problems

If your sound system starts squealing or howling whenever a phone line is introduced, the problem is not in the sound system but in the *interface* to the phone line. Most often, the wrong device has been used for bringing the phone call into the audio system. Telephone "couplers," devices normally costing $300 or less, simply will not work for your application because they cannot adequately isolate the two sides of the telephone call. This inadequate isolation results in 'bleedthrough' of audio from the "send" side of the coupler to the "receive" side, and when this audio is amplified through your sound system, electronic feedback results.

Luckily, phone coupler problems are also easy to resolve. Throw out the couplers and replace them with "digital telephone hybrids," available through your systems integrator or a broadcast equipment dealer. These devices are the same products used at radio and TV stations to bring callers into talk shows. They are considerably more expensive than the couplers (they cost about $800 on the low end and $2500 on the high end) but won't introduce feedback into your audio system.

There is only one "trick" to using telephone hybrids: if the audio sent down the telephone line contains any of the callers' audio, feedback will result. The "trick" is to use what is called a "mix-minus" feed to the caller, which is a mix of all of the audio in your system *minus* the caller's audio. If your mixing system does not have mix-minus capability (most don't), you can either use a separate mixer for the phone line or buy a digital telephone hybrid with "automatic mix-minus" capability (these cost around $1500).

Other Telephone System Concerns

If your distance learning network is an audio-only system based on standard phone lines (rather than digital or satellite transmission), a significant problem can detract from the efficiency of your class: listener fatigue. Simply put, when you listen to a phone call for a long time, your brain has to work overtime just to process out the line noise and compensate for the thin, "tinny" sound of the line.

The best cure for phone line quality is to upgrade your distance learning network to another transmission system such as ISDN, ATM, or fiber optics. These systems offer higher "bandwidth," meaning voices sound natural, and transmission noise is eliminated because digital technology is employed. If your budget does not permit an upgrade of this type, you should at least try to maximize your system through the use of digital telephone hybrids combined with proper microphone and loudspeaker placement at each site.

Satellite Echo

Satellite echo is not a problem for the originating classroom, but can present a significant problem for the remote classes. The problem is this: the distant classrooms, receiving the class via satellite, "call in" their questions to the instructor. In order for the other classrooms to hear the questions, the students' audio is uplinked along with the instructor's voice. Normal satellite delays (usually around ¼ to ½ second) result in the students hearing a delayed repetition of their voices over the satellite. *Satellite echo has nothing to do with acoustic echo and cannot be fixed with normal AECs.*

At present, there is no "easy" fix to satellite echo. The most common methods of overcoming this problem are:

- Push to talk systems—these systems mute the incoming audio until the student has finished speaking; a "hold" is placed on the mute for about a second after the student stops speaking so that the "tail" of the echo does not reach the classroom. The problem is that the "tail" mute often cuts off the first few words of the instructor's response as well. It's important to time your responses when dealing with push-to-talk systems. The delay in responding may feel unnatural to you but will aid in comprehension at the distant sites.

- Alternate receive audio systems—when the class goes to "Q&A" mode, the classes that are calling in to the uplink site simply turn off the audio from their satellite receiver and listen via the phone line instead. In order for this system to work well, each classroom must have a full "audioconferencing" set-up with digital telephone hybrids, microphones and loudspeakers. The uplink site must also be able to feed "mix-minus" audio to each of the sites calling in to the class.

It's important to note that the above "satellite echo" problem occurs only with satellite based networks using one-way video and two-way audio. If your satellite system provides two-way video and audio, it is easier to deal with satellite echo problems at the individual sites (a mix-minus system is employed at the uplink site). However, you must have very good acoustical treatment and AECs at each site, or acoustic echo generated at the distant classrooms will introduce a new form of satellite echo into the system—repeat delayed echoes of everyone!

Summary

Yes, it is hard to achieve good sounding audio in distance learning networks. There are many obstacles beginning with the room acoustics, continuing with the electronics, and ending with user technique (speaking directly into microphones and learning the etiquette of multi-site operation). However, audio problems are not insurmountable. Once your audio system has been correctly "tuned," you will find a dramatic increase in productivity and enjoyment.

Autobiographical Sketch

Craig Richardson received his Sc.B. in Electrical Engineering from Brown University in 1985 and his M.S.E.E. and Ph.D. in digital signal processing from the Georgia Institute of Technology in 1988 and 1992, respectively. In 1992 he joined the staff of ASPI Digital as the Director of Algorithm Development and in 1996 became President and CEO. He has led numerous real-time speech, audio, and video design and development projects and most recently led the design team for an MPEG-2 Layer III application for remote radio broadcasts. In addition to having written numerous articles and chapters in books, he is the co-author of the textbook (with Thomas P. Barnwell, III and Kambiz Nayebi) Speech Coding: A Computer Laboratory Textbook, a title in the Georgia Tech Digital Signal Processing Laboratory Series published by John Wiley & Sons.

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ISDN:
A New Paradigm for Distance Learning, From Desktop to T-1

Pete Royer, Director
Little Crow/Central Lakes
Telemedia Networks

ISDN provides an affordable, accessible and scaleable solution for distance learning enabling voice, data and video transmission over a single line. The TAG project in Minnesota has allowed schools dial up videoconferencing and Internet access over a single T-1 line. The sites have access to the unused bandwidth for increased data capacity and/or additional video access. Besides the typical curriculum advantages for the videoconferencing the sites have also used the video to bring in guest speakers, conduct virtual tours, collaborate with other schools and exchange cultural information with other sites from around the world. Emerging technologies also seem to offer new mediums of communication thus providing even more opportunities for bridging the distance between sites.

ISDN, Integrated Services Digital Network, is deployed world wide, with some countries having as much as 90% coverage. Local access can also be inexpensive, for example, in Hutchinson, Minnesota local ISDN costs only $23 a month compared to over $50 in Minneapolis. Unfortunately 128 Kbs ISDN is not readily available throughout the state of Minnesota or across the United States.

MEANS, a cooperative of local telephone companies in Minnesota has deployed ISDN Primary Rate Interfaces, (PRI), to over 150 sites around the state. PRI's include 23 B channels plus one D channel for signaling. These sites were funded through the Telecommunications Access Grant (TAG) project which provided one codec for each school district without ITV or one codec for each existing ITV network across the state. The Learning Network of Minnesota (LNMn) has standardized on 768 Kbs for connections in state but the codecs are capable of dialing at any rate the customer chooses from 112/128 desktop calls to 384 for outside state connections. But since only half the T-1 is committed for video and only one 56kbs Frame Relay circuit was allocated for Internet/data access, 10 additional 56/64 kbs channels are available for increased data or video capacity.

The TAG Project only allowed for one codec for the existing ITV networks but provided for extra channels and demodulators to connect the codec via an audio/video router to the existing networks. This has allowed any site on an existing ITV Network to increase curriculum opportunities including: Post Secondary Education Opportunities (PSEO's), virtual tours, collaborative projects, and cultural exchanges through the codec.

One of the main advantages of the ISDN connection is that allows us to schedule around bottlenecks in the existing analog ITV networks. Instead of trying to schedule around the Technical College courses and channel capacity of the analog cross connects we can connect directly with St. Cloud State University (SCSU) for PSEO's. In fact for 1998–99 we will be receiving 4 courses per semester via the codec. Prior to accessing the codec we received only one per semester, College French. We are keeping the French on the analog system due the superior image, voice quality and better continuous presence of multiple sites.

The codec has allowed virtual field trips to the Orange County Marine Institute by a couple of fifth grade classes where effects of El Nino were demonstrated live via the codec. Students could interact with the OCMI personnel as well as remote control a "Beach Cam" via a telephone. Almost a dozen classes accessed NASA and learned first hand about the International Space Station, Astronomy and Science in Space. These field trips were tailored to the grade levels as we had fifth to twelfth graders interact directly with NASA personnel.

Two fifth grade classes from Lester Prairie, Minnesota, a rural and 90% Caucasian community, held a cultural exchange with two fifth grade classes in Ontario, California where there was a definite cultural mix. The students exchange questions via e-mail about one week prior to the video conference and each site worked on the answers, creating charts, graphs and even bringing in a cooler of snow to demonstrate their answers!

In addition to these exciting connections we have made contact with Israel, Australia, European and domestic sites for possible connections to add to our curriculum and cultural experiences in Central Minnesota.

The difference between a digital continuous presence and an analog continuous presence needs to underscored. All of the analog networks in Minnesota provide continuous presence via separate audio and video channels displayed on separate video monitors. The digital method involves a quad split, putting each site into a one fourth image display onto one video signal. This also mixes the audio together which puts more emphasis on balanced audio outputs from each of the sites and gives the receive sites little or no control on adjusting an individual site's audio levels. Another major drawback to the quad split is the small picture size especially as it relates to the originating site and overhead information being displayed by an instructor.

But the quad split is preferred over speech activated controlled which switches one video/audio source depending on who last talked or is talking the loudest. Actually this method switches to the site making the most noise which is sometimes not the site that is speaking. The other method of control, chairman control, allows one site to dictate what all the sites will observe. Chairman control is not available to our sites at this time.

The LCTN and CLED were given the go ahead to beta test desktop systems. Using excess BRI's off the ISDN T-1 we connected a PictureTel Live 200 codec card to a PC. After reconfiguring the bandwidth manager, the desktop unit was used to call another desktop and a room codec, all at 128 kbs, with no problems. Connecting with the other desktop units the full features of the desktop units can be accessed: snapshot, desktop collaboration, annotation tools. A MacIntosh version, Sagem, was tested as well. Due to the fact that this product did not have the T.120 standard desktop collaboration tool it was not considered for purchase although the Sagem model successfully connected to other desktops and room codecs.

Desktop applications included accessing guest speakers, conducting virtual tours and collaborating with other schools. The biggest limitation of the desktop units is the small screen size which couldn't accommodate more than six to seven people. The Desktop units were very good at connecting to those sites that only were only capable of placing calls at 128 kbs rate thus relieving the pressure off the 768 kbs codecs. The frames per second is another important consideration of desktop codecs most of the connections were at 15 fps which was adequate for the type of application but would probably be unacceptable for everyday transmission of "regular" ITV classes.

IP based videoconferencing allows for desktop to desktop connections with a major limitation being the LAN/WAN bandwidth. IP conferencing can also be connected to a gateway computer thus allowing the IP desktops to access outside codecs. Some gateways are able to mux multiple ISDN BRI's together to form 384 kbs calls, the standard business rate.

There are multiple standards that need to be analyzed, H.320, H.323 and T.120. The H.320 is the standard involving connection primarily between room codecs and MCU's. The. H.323 involves the emerging products related to gateway/IP based codecs. The H.320 and H.323 work in tandem for IP based codecs allowing for connections between room codecs and IP based codecs thereby allowing for seamless transmission between room codecs, IP codecs and MCU's. The T.120 is the standard for multimedia data collaboration is a very valuable standard as it is the basis for the collaboration tools which makes the desktop application a very powerful medium. By allowing both sites to simultaneously see annotations, drawings, as well as the audio/video, the desktop codecs provides a tremendous linkage between distant sites going beyond the talking head.

The ability to dial-up other sites with little or no scheduling, scaling the bandwidth to meet your needs and allowing for increased data/video bandwidth has made ISDN a very viable solution for schools in Minnesota. The emerging IP and desktop codecs will have their place in distance learning too but will not replace room codecs or for that matter analog ITV networks. The ability to place a codec call from the desktop and mux multiple BRI's to achieve 384 kbs connections, desktop and IP Gateways are emerging areas providing a powerful codec for very little cost. Keeping the various standards in mind when testing a codec and monitoring the fps are key to purchasing a codec that will stay current and provide years of use. ISDN offers a lot of options over any dedicated network, and is going to be the basis for distance learning in Minnesota for the foreseeable future.

Autobiographical Sketch

Pete Royer is the director of the Little Crow Telemedia Network-Hutchinson, Minnesota, and Central Lakes ITV-Willmar, Minnesota. Both are 100 mile analog fiber optic networks connecting high schools, technical colleges and state universities. He has been the director of the LCTN since its inception in 1989 and of Central Lakes since 1993.

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Collaborative Distance Learning Using Interactive Video: Lessons Learned From the University of Cincinnati/ Ohio State University Experience

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Introduction

The Ohio State University (OSU) and the University of Cincinnati (UC) have collaborated on the development and presentation of a team-taught course related to the design and operation of the mechanical, electrical, thermal-hydraulic, and control systems used to operate commercial nuclear power plants (Christenson, et al. 1994). The course, Nuclear Power Plant Systems and Operations, is a two-quarter course offered to seniors and graduate students at both universities through interactive video. Two faculty members from each university participated in the development of the course and preparation of course materials. The faculty felt a team-taught course would provide significant improvements over a single university offering since each instructor had a unique set of academic and industrial experiences which could positively impact the course. Expertise and experience among the group encompassed plant operations, probabilistic risk assessment, system design and engineering, and nuclear power instrumentation and control.

The syllabus was developed such that approximately half of the lectures originated from each university. Generally, each lecture features only one instructor, but on occasion, instructors at both universities contribute toward a particular topic. Instructors encourage and respond to inquiries and comments from students in both the local and remote classrooms. Each of the instructors share in writing exam questions, but the exams are administered by one faculty member at each university. Grades are assigned independently at the universities as well.

The video classrooms are housed within the engineering colleges at both universities. The classrooms are essentially identical in their layout and furnishings. They are equipped with cameras, microphones, projection devices, video cassette players, monitors, and the electronics required to transmit and receive various signals from remote locations. The OSU and UC classrooms are connected via an interactive video network administered by the Ohio Aerospace Institute. This network is a two-way, interactive, full duplex system which utilizes compressed digital video technology. Local loop connections are provided by local telecommunications companies while a central provider is responsible for bandwidth and circuit switching.

Lessons Learned/Recommendations

The team-taught course described is a fairly rare application of distance learning and represents the first time either the University of Cincinnati or The Ohio State University had undertaken team-teaching over an interactive video network. As in any new undertaking, there were a number of challenges to overcome in successfully implementing the technology and coordinating the efforts of the participants. With the use of distance learning as a pedagogical framework increasing (Chronicles of Higher Education, 1995), we felt a compilation of the lessons learned from our experience would benefit the larger academic community. These lessons are enumerated below.

- Distance learning using an interactive video network requires the use of electronic equipment, telecommunication services (equipment and service providers), and possibly personal computers or a local computer network. Successful presentations are dependent upon each piece of equipment functioning properly and all communication links operating appropriately. If there is a failure in equipment or service, students at the remote site will not participate in that class session.

  Recommendation: Prior to each class period, the video network should be functionally tested by verifying operation of equipment in each classroom and the communication links between the classrooms. If computer hardware and software used during the presentation are maintained by someone other than the instructor, proper functioning of the devices and programs should be performed prior to their use.

- Careful attention to classroom layout, particularly the placement of cameras, is important. It is very advantageous for the lecturer to have a real-time image of the students in the remote classroom. Likewise, providing quality audio and video signals to the students in the remote classroom improves learning and promotes student interest.

  Recommendation: If possible, individuals who will be using the electronic classrooms should be actively involved in the design and layout of the classroom. The design process should involve individuals who have experience with distance learning techniques and technology. Shields (1995) provides a useful overview of some of the technologies available for distance learning applications while Chiricozzi et al. (1995) provide a very detailed discussion of classroom equipment and communication protocols.

- Use of an electronic classroom for distance learning places significant additional responsibilities on the instructors over traditional teaching methods. Instructors must verify proper operation of the classroom and communication links (see item above); provide hard copies of any hand out materials to students at the remote site; and ensure that visuals used are of sufficient quality to be appropriate for use over a video network.

  Recommendation: Instructors should allow additional preparation time when involved in distance learning courses. Presentation materials should be reviewed and updated as needed to meet the needs of video presentations. Handout material should be provided to the instructor at the remote site on a predetermined schedule (two days prior to each class has worked well). As noted above, proper functioning of the interactive video network should be performed.

- The classroom described contains a significant amount of electronic equipment. It is a non-trivial matter to understand the operation and maintenance of individual pieces of equipment and the integrated performance of the classroom.

  Recommendation: A centralized office should maintain a staff of two or three individuals who have been trained to operate and maintain the classroom and who are familiar with the types of problems that may be encountered. These individuals should be available during functionality testing of the classrooms and at the start of each class period.

- Regardless of the advance preparations and technical support available, situations will arise which prevent a distance learning session from proceeding (e.g. local thunderstorms which make the video network unusable, sudden illness of the lecturer at the originating site, equipment failure, etc.).

  Recommendation: Faculty at both sites must be prepared with contingency plans if problems exist with the network or classrooms, or if the individual providing the lecture for that session is not available. Possible contingency plans include substituting another lecture for the one planned, having a different faculty member present the material, reconvening at another time, or taping the lecture at the originating site and then providing the tape to the other university. The point cannot be made too strongly that faculty at both universities must be prepared for a variety of problems if the students are to be properly served.

- As reported in the literature (Felder and Silverman, 1988; Daily and Daily, 1994) we have found that use of multi-media promotes student interest in the course material and can increase students' retention of subject matter. However, effective use of multi-media presentations requires a greater degree of preparation by the instructor and presents additional logistical problems in an electronic classroom. The instructor needs to both use the devices for presentation correctly and ensure that the proper image(s) have been selected for display on the video network.

  Recommendation: Instructors should increase the use of multi-media and improve their effectiveness at this type of presentation by increasing their proficiency at using the various devices in the classroom. It is often necessary to rehearse for a class session when multiple techniques of information dissemination are used.

- Students have indicated (through informal class evaluations and group interviews following the course) that traditional lecture presentations are particularly unengaging for students at the remote site. Changes in teaching style are needed if students are to actively participate in the distance learning process (Hajek, 1995).

  Recommendation: Instructors should avoid lecture-only presentations. Instructors should also seek to incorporate mechanisms for active learning which involve students at both the local and remote sites. Mehta (1995) describes one simple method for active learning which can be applied to distance learning courses, while James (1996) provides a compilation of useful instructional tips (also see Cates, 1992).

- When a single course has multiple instructors participating in the delivery of the course, a good deal of coordination is required to ensure all aspects of the course are adequately carried out. The amount of coordination required is still greater when the instructors are from different universities. Coordinating which instructor gives which lecture at any class period is only a small part of the logistical oversight needed. Homework assignments and exams must be formulated by all instructors involved in teaching the particular subject matter.

  Recommendation: The participants should interact frequently prior to offering the course to develop an appropriate syllabus which delineates both the subject matter and instructor for each class period. The syllabus should also define when homework is to be assigned and collected, and when exams are to be administered. We have found conference calls to be an effective mechanism for interaction. In addition, one individual should be identified as the person with final responsibility for preparing the exams and distributing the exams to both universities.

- Students and faculty both benefited from having teaching responsibility shared among faculty from two universities. Students benefited from having instructors with diverse backgrounds and experience present topics they knew extremely well. The faculty benefited by being able to dedicate significant amounts of time on individual class presentations since no one instructor had to prepare all the lectures for the class. The participating universities each provide an engineering course to their students with less than normal use of faculty resources.

  Recommendation: Team-teaching of courses should be utilized as appropriate.

- Although each of the instructors contributing to the class had a good deal of knowledge on the subject matter, each of us learned a great deal more about aspects of the material because of the collaboration. Working together on a common project has facilitated further collaboration between the two universities.

  Recommendation: Collaborations between faculty at different universities should be pursued to the extent practical.

Future Plans

Further improvements to the classroom layout and facilities are being pursued. It would be advantageous to free the instructor from some of the responsibilities of equipment manipulation required for effective use of the electronic classroom. Automatic tracking of the instructor's movements by the camera would allow for more freedom of movement and better interaction between the instructor and students. Improvements to the equipment used to present multi-media are also being sought. Items that allow better utilization of Internet resources are of particular interest.

The instructors are investigating mechanisms to improve the teaching styles used in the electronic classroom. We hope to identify relevant techniques in the literature and through discussions with individuals in communications related fields. A formal implementation and evaluation of pertinent techniques is anticipated.

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Education, Assistance, and Support Needed for Distance Delivery: Faculty and Administrators' Perceptions

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Distance Education . . . taking the educational process beyond the "four walls" of the traditional classroom. This educational method provides opportunities for institutions of higher education to deliver instruction and training to geographically diverse audiences of all ages through the use of telecommunication technologies. What kind of educational opportunities do faculty want to help them incorporate distance delivery? What kind of assistance do they need? What kind of support do they want? To expand distance delivery in the future, it's important to understand the type of education faculty need so they can develop their skills and build appropriate teaching strategies.

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Public expectations that education needs to be accessible in the workplace, marketplace, and home, as well as in traditional educational settings (Nebraska Network 21 Project Team, 1995) are increasingly being met by using technology to teach both formal and non-formal education via distance. The University of Nebraska, as well as other institutions of higher education, are converting classroom-based courses into distance offerings to meet learner requests that institutions provide educational opportunities throughout the state.

The Institute of Agriculture and Natural Resources (IANR) at the University of Nebraska-Lincoln has *A Strategic Plan* (1995) calling for expanding distance delivery for educational programs. While opportunities exist for delivering distance education, faculty often express concerns about teaching via distance. In order to better understand faculty concerns about distance delivery, a mail survey was developed in 1997. It addressed the type of preparation faculty want to help them build appropriate teaching skills for distance education delivery (Schauer, 1997).

Specifically, it addressed:

- The type of education, assistance, and support faculty need to develop educational materials for distance delivery.
- Differences in the way education, assistance, and support are viewed by (a) teaching faculty and administrators, (b) teaching faculty who have or are teaching via distance, expecting to teach via distance in the next three to five years, and never expecting to teach via distance, (c) faculty who have taught 10 years or less, 11 to 20 years, and more than 20 years, (d) tenured and non-tenured faculty, and (e) faculty teaching only undergraduate classes and those teaching only graduate classes.

The target audience for the survey was faculty and administrators in the Colleges of Agricultural Sciences and Natural Resources (CASNR) and Human Resources and Family Sciences (CHRFS) at the University of Nebraska-Lincoln. Out of 30 administrators and 207 faculty who had any proportion of their FTE assigned to teaching, 70% returned the survey.

A Profile of Survey Respondents

Out of the responding group, 53% were full professors and administrators, 42% were associate and assistant professors, and 5% were instructors; 80% were tenured; 28% taught for less than 10 years, 35% between 10 and 20 years, and 36% more than 20 years; 23% taught undergraduate level courses, 13% graduate level, 60% both levels, and 4% were not teaching at the time of the survey.

Slightly over one-fourth (26%) of the teaching faculty have taught via distance. They obtained their distance teaching experience by teaching either an entire course, parts of a course, or workshops. Another two-fifths (40%) expect to teach via distance within three to five years, while one-third (34%) never expect to teach via distance.

Educational, Assistance, and Support Needs for Faculty

There were 39 items listed on the survey that related to educational needs, assistance, and institutional support for the faculty who deliver instruction via distance. These items were rated on a scale where 1 = very important, 2 = somewhat important, 3 = somewhat unimportant, and 4 = very unimportant. Using the overall mean score, 13 of the items were classified as very important while 26 items were classified as somewhat important (Table 1). None of the items were classified as unimportant needs for helping faculty deliver education via distance.

Very Important Needs

In the very important category, several individual items appear to group together. Therefore, faculty feel it is most important to obtain further education about, assistance with, or support for (a) developing interaction, (b) developing instructional materials, and (c) applying selected technologies. They also feel it is very important to have assistance with 'marketing a course,' an item that does not fit into a grouping with other items.

Table 1. Ranking of Issues Related to Education and Support Needs for Faculty

Very Important*

Issue	Mean
Instructor to student interaction	1.34
Developing materials for students that support . . . the course content	1.35
Marketing the course	1.41
Students' interaction with the instructional content	1.41
Developing an instructional design	1.43
Student feedback	1.43
Additional operational support	1.46
Web-based delivery strategies	1.46
Developing materials for students that support . . . the use of the required technology	1.46
Mixing technologies	1.47
Having a general knowledge of distance education	1.48
Providing a local contact point for students	1.49
Implementing various teaching techniques and strategies	1.50

Somewhat Important*

Issue	Mean
Planning and developing curriculum content	1.53
Developing support materials for assistants or facilitators	1.54
Integrating multimedia applications	1.54
Outcome evaluation (summative)	1.55
Designing graphics	1.56
Providing easier access to library services for students	1.56
Student or graduate assistance/help	1.56
Clarifying transfer issues	1.57
E-mail usage	1.58
Process evaluation (formative)	1.58
Taking care of registration	1.60
Student to student interaction	1.62
Addressing student learning styles	1.65
Copyright issues	1.65
Reduction in duties	1.65
Clarifying tuition costs	1.71
Videotape development and usage	1.74
Audio conferences	1.85
Peer feedback	1.89
Satellite delivery strategies	1.93
A mentoring partner	1.98
Issues of teacher certification when institutional boundaries are crossed	2.05
Registration policies for distance courses	2.18
Tuition and fee requirements	2.29
Issues addressed by the Nebraska Coordinating Commission for Post-Secondary Education	2.40
Increase in pay	2.43

*Scale: Very Important: $M = 1$ to 1.50; Somewhat Important: $M = 1.51$ to 2.49.

Developing interaction. The specific items grouped together include:

- Instructor to student interaction
- Student interaction with the instructional content
- Student feedback
- Providing a local contact point for students

Faculty who tended to rank 'instructor to student interaction' higher in importance were those who have taught 10 years or less and those teaching only undergraduate courses. Those who tended to rank 'student interaction with the instructional content' higher in importance were those teaching only undergraduate courses and non-tenured faculty. Faculty who tended to rank 'providing a local contact point for students' higher in importance were those teaching only undergraduate level courses.

Developing instructional materials. The specific items grouped together include:

- Developing materials for students that support the course content
- Developing an instructional design
- Additional operating support
- Having a general knowledge of distance education
- Implementing various teaching techniques and strategies

Faculty who tended to rank 'developing an instructional design' higher in importance were those who taught only undergraduate courses. Faculty who taught 10 years or less also tended to view 'developing an instructional design' as more important than did the faculty with more than 20 years teaching experience.

Faculty who tended to rank the need for 'additional operating support' higher in importance were those who taught only undergraduate courses.

Faculty who tended to rank 'implementing various teaching techniques and strategies' higher in importance were those who taught only undergraduate courses and non-tenured faculty. Those teaching faculty having or expecting to teach via distance also ranked 'implementing various teaching techniques and strategies' as more important to know about than did the faculty never intending to teach via distance.

Applying selected technologies. The specific items grouped together include:

- Developing materials for students that support the use of the required technology
- Web-based delivery strategies
- Mixing technologies

Faculty having taught, or expecting to teach via distance tended to rank 'mixing technologies' higher in importance than did the faculty never intending to teach via distance. Faculty who taught 10 years or less tended to rank 'mixing technologies' higher in importance than did the faculty with 11 to 20 years teaching experience.

Somewhat Important Needs

In the somewhat important category, items appear to group together into six general categories: (a) curriculum content, design, and evaluation, (b) assistant help, (c) selected technologies, (d) logistics, (e) peer support, and (f) workload compensation. All items related to curriculum content, design, and evaluation along with those related to assistant help fell within the upper range of the somewhat important category (means between 1.53 and 1.65). The items related to selected technologies tended to have slightly lower means than the previous two groupings, but they still remained above the somewhat important score of 2.0. Logistical issues related to student services remained above the somewhat important score of 2.0 while logistical issues related to overall policies fell below the somewhat important score of 2.0. Peer support items remained above the somewhat important score of 2.0. Workload compensation was split—'reduction in duties' ranked above the somewhat important mean of 2.0 while 'increase in pay' ranked close to being unimportant.

Curriculum content, design, and evaluation. The specific items grouped together include:

- Planning and developing curriculum content
- Outcome evaluation
- Designing graphics
- Process evaluation (formative)
- Student to student interaction
- Addressing student learning styles

Faculty who tended to rank 'student to student interaction' higher in importance were those teaching undergraduate level courses, those with 10 years or less teaching experience, and non-tenured faculty. Faculty who tended to rank 'addressing student learning styles' higher in importance were those teaching undergraduate level courses and non-tenured faculty. Faculty who tended to rank 'process evaluation' higher in importance have taught 10 years or less or were non-tenured.

Assistant help. The specific items grouped together include:

- Developing support materials for assistants or facilitators
- Student or graduate assistant help

Those faculty who taught 10 years or less ranked 'developing support materials for assistants or facilitators' higher in importance than did the faculty with more than 20 years teaching experience. Faculty who tended to rank 'student or graduate assistant help' higher in importance were those teaching only undergraduate level courses.

Technologies. The specific items grouped together include:

- Integrating multimedia applications
- E-mail usage
- Videotape development and usage
- Audio conferences
- Satellite delivery strategies

Faculty who taught 10 years or less tended to rank 'integrating multimedia applications' and 'email usage' higher in importance.

Logistics related to student services. The specific items grouped together include:

- Providing easier access to library services for students
- Clarifying transfer issues
- Taking care of registration
- Copyright issues
- Clarifying tuition costs

Faculty teaching undergraduate level courses saw the items of 'providing easier access to library services for students' and 'copyright issues' as more important than did faculty teaching graduate level. Administrators saw the items of 'taking care of registration,' 'copyright issues,' and 'clarifying tuition costs' as more important to know about than did faculty.

Logistics related to overall policies. The specific items grouped together include:

- Issues of teacher certification where institutional boundaries are crossed
- Registration policies for distance courses
- Tuition and fee requirements
- Issues addressed by the Nebraska Coordinating Commission for Post-Secondary Education

Faculty who teach only undergraduate courses tended to rank 'providing easier access to library services for students' and 'copyright issues' higher in importance. Those teaching only undergraduate courses also tended to rank 'issues of teacher certification when institutional boundaries are crossed' higher in importance. Faculty who have taught 10 years or less tended to rank 'issues of teacher certification when institutional boundaries are crossed' higher in importance than did the faculty with more than 20 years teaching experience. Faculty who have taught 10 years or less tended to rank 'issues addressed by the Nebraska Coordinating Commission for Post-Secondary Education' higher in importance than did the faculty with 11 to 20 years teaching experience. Non-tenured faculty tended to rank 'tuition and fee requirements' higher in importance.

Administrators were more likely to view the item of 'tuition and fee requirements' as more important to know about than were faculty.

Peer support. The specific items grouped together include:

- Peer feedback
- A mentoring partner

Faculty teaching only undergraduate courses tended to rank 'peer feedback' higher in importance. Those faculty with less than 10 years teaching experience tended to rank 'mentoring partner' higher in importance than did the faculty with more than 20 years teaching experience. And, non-tenured faculty also tended to rank 'mentoring partner' higher in importance.

Workload composition. The specific items grouped together include:

- Reduction in duties
- Increase in pay

Non-tenured faculty tended to rank 'reduction in duties' higher in importance. Faculty with 11 to 20 years teaching experience tended to ran 'increase in pay' higher in importance than did faculty with more than 20 years teaching experience. And, those teaching only undergraduate courses also tended to rank 'increase in pay' higher in importance.

Challenges

Since another 40% of the teaching faculty who responded to the survey expect to take on the challenge of teaching via distance in the next two to five years and support IANR's Strategic Plan, the Institute has a number of challenges for providing educational opportunities, assistance, and support for this changing educational strategy. Specific issues to address to help faculty prepare to teach via distance are:

- **Interactive learning experiences**—Educational opportunities for faculty need to focus on providing student learning experiences that support an interactive learning environment. This includes developing materials that mix technologies and make use of web-based opportunities.

- **Designing and improving the curriculum**—Educational opportunities focusing on curriculum content, design, and evaluation should be integrated into an educational package that has an overall focus on developing interactive learning experiences for the student.

- **Marketing courses**—Strategies to market courses need to continue to be developed by others who support distance delivery so faculty can devote their efforts to the educational process.

- **Assistant help**—Strategies should continue to be developed to support assistants or facilitators and funds should be identified to offer graduate assistant help.

- **Technical processes**—Education on specific technical process (e.g. integrating multimedia applications, e-mail usage, videotape development, audio conferencing, and television delivery) should be available as faculty need to use a specific process.

- **Peer support**—Opportunities need to be available to distance teachers to obtain peer feedback and work with a mentoring partner if they so desire.

- **Workload support**—Consideration needs to be given to adjusting duties to accommodate course development rather than offering additional financial reimbursement.

- **Logistics related to student services**—Other entities need to continue to address logistics related to student services (e.g., library services, transfer issues, registration, copyright, and tuition costs), but faculty should have a working knowledge about how these issues impact on distance teaching.

- **Logistics related to overall policies**—Administrators need to continue to focus on the logistics related to overall policies (e.g., teacher certification issues, registration policies, tuition and fees requirements, and Coordinating Commission for Post-

Secondary Education) that affect distance delivery and just keep faculty informed about them.

As more and more faculty teach via distance, their needs for education, assistance, and support will need to be monitored so institutional assistance can be adapted as technologies change and faculty experiences are shared throughout different departments. The most supportive aspects can then be implemented within the Institute so the goals for distance education in IANR'S Strategic Plan can be realized.

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Autobiographical Sketches

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How to Maximize Use of Technology and Institutionalize Distance Learning Efforts

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Abstract

Research and field work by Schreiber has resulted in the development of a model that profiles organizations as they attempt to implement strategic distance learning. This model, "Stages of Organizational Technology Capability for Distance Learning," identifies behaviors exhibited by business and industry that maximize use of technology for education and training at a distance, and ultimately institutionalize their efforts.

It is the organization with a "Stage 4" *Distance Learning Capability Profile* which exhibits the strongest success rate for designing and implementing distance training. This type of organization has evolved into an institution that facilitates interdisciplinary teamwork, understands the strengths and weaknesses of information and communication technology, manifests distributed decision-making, supports broad access to organizational technology, and is receptive to innovative budgeting strategies. The Stage 4 organization also recognizes a dynamic core distance learning team and provides comprehensive documentation of an organization-level technology plan.

Introduction

Business and education specialists, trainers and managers traditionally have looked to developments in communications technology to deliver distance learning. Now, after a century of dramatic change and innovation in organizational and instructional hardware and software, telecommunications and satellite technologies are poised to support significant improvement in the interactivity, collaboration and real-time delivery of distance education and training. Yet with such promise, not all organizations are successful in their efforts to deliver distance learning.

To realize the full potential of distance learning, corporations and agencies must apply an analytical approach to the design and delivery of events, select and utilize organizational technology effectively, and establish a collaborative support structure within the organization to maintain and sustain efforts (Pisel, 1995; Schreiber, 1995). Often times distance training applications are not defined by an organization's business goals and objectives. The result is an event that may be effectively implemented (from a procedural perspective) but contributes minimally to an organization's strategic gain. Or, the technology used to deliver a distance learning event may have been selected simply because it is what the company owned, not because it provides the most effective medium for delivery of instruction. Finally, the organizational technology and instructional personnel may have been treated as marginal costs rather than core costs of distance learning (Green). This results in front-end expenditures which may significantly exceed expectation (Picard) and produce less than desired overall return-on-investment. (Note: Green describes core costs as the "costs of doing business" (p. J2) and are represented by budgeted line items. Marginal costs are "non-documented overhead or embedded costs" (Green, p. J2) and are often bundled into already existing core accounts.) Whatever the specific causes, initial distance learning efforts can be dismal when critical components of the process are overlooked or misunderstood.

Distance and distributed learning represents a process composed of multiple components which involves diverse personnel, including technical and non-technical staff in the organization. Employees from management information systems (MIS), broadcasting, and integrated technology (IT) functions must collaborate with instructional designers and training specialists from human resource management (HRM) departments and learning centers. The need for sophisticated and strategic distance training demands that telecommunications experts, specialists from computer services and business operations, as well as, instructional designers and training specialists, no longer function separately or isolated from one another.

Knowledge of the roles and responsibilities traditionally exhibited by staff helps to improve collaborative efforts among diverse experts for new efforts such as business-driven distance learning. However, even with the availability of prescribed models for design and implementation of distance training, there is continuing difficulty on the part of employees and organizations to participate in cooperative efforts that are systematic and rational (Dipboye, 1997). This may be attributed to the diverse background experiences and intellectual perspectives that make up the personalities of the individuals involved. Overcoming this and other barriers or constraints within the organization, however, is critical to maximizing utilization of technology and institutionalizing distance learning efforts.

Organizational Technology Capability to Provide Distance Training

Designing and implementing distance training that contributes strategically to the organization requires not only a new organizational chart, but often a transformation of the corporate culture itself (Cronin). Maximizing utilization of technology to deliver distance and distributed learning is not dissimilar to reengineering processes in that there is a redefining of roles and responsibilities. Compelling influences from technology and education experts, as well as, executive management, requires that the traditional corporate hierarchy evolve into a more flexible institution that facilitates teamwork, collaboration with internal (as well as, external) business partners, and distributed decision-making.

Field work and research by Schreiber (1998) has identified the primary cultural characteristic of a corporation, agency or institution which significantly impacts effective implementation of distance training as the organization's level of capability to utilize technology. This concept of *organizational technology capability* describes an organization's degree of sophistication with which technology is applied to distance learning to resolve business needs.

The stages of organizational technology capability for distance learning are illustrated in Figure 1. These stages are best described as the level of maturity an organization exhibits in understanding, acquiring and using technology to deliver distance training. The "maturity level" discussed here is similar to that researched by Paulk, et al., which references data information systems (1993). Paulk describes a maturity level as "a well-defined evolutionary plateau toward achieving a systematic and systemic process" (p. 7). (For more information about maturity levels, see: Paulk, Mark et al. (1993). Capability Maturity Model^{SM} for Software. Version 1.1. *Technical Report CMU/SEI-93-TR-024.*)

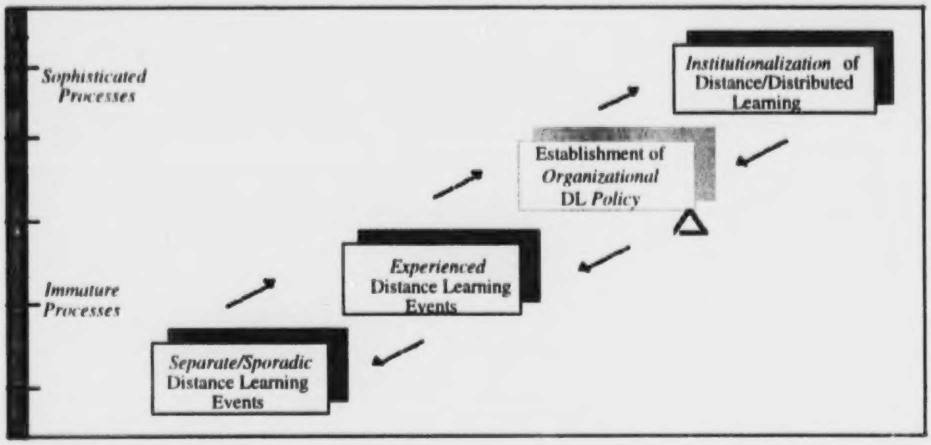
Sophisticated Processes
Immature Processes
Separate/Sporadic Distance Learning Events
Experienced Distance Learning Events
Establishment of Organizational DL Policy
Institutionalization of Distance/Distributed Learning

Figure 1. Stages of Organizational Technology Capability for Distance Learning

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There are four primary stages of capability which an organization may experience when utilizing technology to deliver distance and distributed learning. The first stage represents an organization that is just *beginning* to implement distance learning. This organization currently delivers separate and sporadically planned distance education and training events. Each event is sponsored and budgeted by an individual function or department. And one area of the organization is unaware of what another area is doing. The application of distance training is fragmented at this stage.

The second stage of organizational technology capability is manifested by distance education and training events that are repeated or duplicated by the organization. The organization is now considered somewhat experienced with distance training. The corporation or agency often forms an interdisciplinary team at this time and the participating members respond to staff and management inquiries and recommendations regarding distance training.

The ultimate capability stage for implementing distance training is illustrated by the organization that understands the strengths and weaknesses of various delivery tools, correlates instructional materials development to these strengths and weaknesses, and truly maximizes utilization of the technology. This organization also has successfully institutionalized its efforts in distance and distributed learning.

As an organization evolves from a level of immaturity to a level of sophistication in its application and utilization of technology to deliver distance learning, however, it experiences a point of transition that is pivotal to its evolutionary progress. This stage of corporate development is defined by the establishment of organizational policy and procedure regarding distance and distributed education and training. These policies and procedures are driven by organizational vision and mission, and subsequent distance learning events and programs are recognized for strategic contributions and response to business needs.

Figure 1 illustrates organizational capability for maximizing use of technology to implement strategic distance and distributed learning. Following is further explanation of the various maturity levels an organization may experience and the significant and unique influence each bears on an agency's or institution's ability to successfully deliver, support and sustain strategic distance training efforts.

Separate/Sporadic Distance Learning Events

An organization's initial attempt at distance learning often includes a single training event, with a migration toward multiple events which are sporadically planned and separate or unknown from one sponsor (or department) to another. An event's target audience is identified however, and individual characteristics are analyzed. The designers and developers of each distance training event define clearly the instructional goals and generally meet expectations of the participants.

In the first level of the maturation process, an organization's capability to technologically support distance and distributed learning is limited. Each distance training event is spearheaded by an individual staff member or an individual department, independent of input or collaboration from other functions in the organization. The technology used to deliver the instruction is rented, leased, or procured in some other way for a short time. If the technology is owned by the company or agency, it's access is often controlled (or greatly influenced) by the sponsor(s) of the distance training event.

Research indicates that the success of distance training relies on linking intended performance outcomes to the business goals and objectives of the organization (Eskow, 1997; Green, 1997; Robinson and Robinson, 1996; Steward, 1995; and Newman, 1997). The more aligned performance outcomes are with a company's corporate mission and vision, the greater the strategic impact of the distance training event in providing solutions to business problems (Schreiber, 1996). Such alignments also result is improved documentation of an organization's distance learning activities and broader communication among staff and management of the effects of distance learning, as well as, the strengths and weaknesses of various technologies to deliver distance learning. Employees begin to understand corporate education and training needs relative to specific business requirements (Steward, 1995).

In the early stages of an organization's technological capability to support distance learning, few of the aforementioned objectives are realized. No link exists between the distance training event and strategic planning by the organization. There is little understanding of the strengths and weaknesses of organizational technology to deliver distance learning. Absence of a technology plan also results in uninformed and often expensive decisions regarding procurement of hardware and software to deliver distance education and training. And finally, because the distance training event occurs in relative isolation of other business activities, communication about distance learning throughout the organization is minimal and collaboration is overlooked.

Experienced Distance Learning Events

As an organization's experience increases in delivering distance training, its technological capability to support distance learning matures. The initial distance education and training events become standard practice and replication occurs. At this stage of Organizational Technology Capability for Distance Learning, a corporation or agency often forms an interdisciplinary team and the participating members respond to staff and management inquiries and recommendations.

Members of the interdisciplinary team represent the diverse content expertise needed to enhance an organization's capabilities to provide distance learning. Consequently, the distance learning team may include one or two individuals from each of the following organizational functions: executive branch, information technology, network systems, broadcasting, communications, instructional design, and training or performance consulting. This team contributes as a core steering committee for the organization's distance learning efforts. The primary strength of the team is its ability to facilitate collaboration among diverse content experts.

Collaboration among diverse content experts (including information systems engineers, performance consulting professionals, and executive management) is a recognizable characteristic at this level of organizational maturity. The impact of successful collaboration on distance learning ensures a higher probability that the distance training event (and subsequent distance learning programs) will yield the organization's intended outcomes to meet business needs. Robinson and Robinson (1996) explain that the phenomenon of collaborative efforts can result in the following: (a) increased accuracy of analysis, (b) effective identification and accountability for processes and procedures associated with the task or event, (c) increased investment of time and ownership in support of team effort, (d) improved diagnosis and documentation of strengths and weaknesses of task or event, and (e) development of relationships based on trust and respect. It is the significant collaboration at this second stage in the model that becomes critical to ongoing maturation by the organization for technological capability to support distance learning.

Establishment of Organizational Distance Learning Policy

The first step in establishing organizational policy and procedure for technological support of distance and distributed learning is to develop a *technology plan*. It is the role of the interdisciplinary distance learning team to collaboratively develop a plan which aids the organization in the identification and selection of technology to deliver distance training (Schreiber, 1996; Green, 1997).

An organization's technology plan guides decision-making regarding procurement and utilization of technology. It provides policies and procedures for analyzing cost-benefits, allocating resources, and controlling budgets. A well-developed technology plan is a component of an organization's mission and strategic statements, and is defined relative to the organization's business goals, initiatives and challenges for the near-future (Green). Also, an organization's technology plan should include (a) an overall financial plan for routine amortization and replacement of computers, software, and other key hardware/ software components, (b) a defined role for information technology and www resources in the distance learning effort, and (c) a strategic plan for the role of information technology in instruction and distance training, as well as, dissemination of information that is content specific.

An organization's technology plan provides a stable and predictable process to facilitate the identification and selection of appropriate distance learning delivery media. It establishes access to diverse delivery media, accounts for flexibility, and aligns utilization of organizational technology with company priorities and business objectives.

Broad access to diverse distance learning technology critically affects organizational distance learning policy and procedure. It prevents rigid or demanding delivery strategies which may constrain implementation or result in missed opportunities (Cronin, 1994, pg. 247). Planning for flexibility facilitates strategic acquisition of distance learning delivery tools and avoids potentially insurmountable financial commitments (Cronin, 1994, pg. 247; Brown, 1997). And finally, aligning utilization of organizational technology with company priorities regarding distance training, facilitates internal cooperation and collaboration and increases communication of associated business objectives. Opportunities are recognized and innovation is embraced (Cronin, 1994).

As an organization evolves from a level of immaturity to a level of sophistication in its application and utilization of technology to deliver distance learning, it experiences this stage of transition that is pivotal to its evolutionary progress. To successfully move to the next level of technology capability for distance learning, an organization must effectively engage all members of the organization. Individuals will not buy-into or support evolving distance learning policies and procedures if they lack confidence in the system, see limited pay-off, or disagree with values and/or concepts propagated by the core steering committee (Schreiber, 1996; Robinson and Robinson, 1996).

The following practices and processes facilitate the establishment of organizational policies for distance learning and engage staff and management support during transition (extrapolated from: Robinson and Robinson, 1996; Bridges, 1988; and Moss-Kanter, 1983): (a) increase parameters within which individuals may contribute ideas and suggestions regarding technology for delivering distance training; (b) increase parameters within which individuals can make decisions regarding development and implementation of distance learning; (c) develop policies and procedures which provide accurate and timely information about commercial products, services, and current corporate technological capabilities; (d) modify work processes that inhibit broad-based collaboration across disciplines; and (e) ensure that associated administrative tasks are directly focused on processes of design, development and delivery of the distance training events.

Institutionalization of Distance and Distributed Learning Efforts

The existence of corporate policies and procedures regarding distance training, and the communication of associated business objectives, facilitate the phenomenon of "whole-company" ownership for distance learning. Cronin identifies whole-company ownership as an organizational attribute which guides transition and growth (1994, p. 250). The corporation or agency which exhibits Stage 4 behaviors has established a distance learning identity and conducts systematic assessment of distance training events with an organizational perspective.

Traditional evaluation of distance learning includes assessment of student interaction, instructor capabilities, degree of knowledge acquisition and skills development, and overall return-on-investment. Evaluation of distance learning from an organizational level (or whole-company perspective) may include assessment of the following additional characteristics: learner-learner and learner-instructor interactions, learner motivation, quality assurance, business-driven performance objectives, organizational support, contributions of interdisciplinary design and implementation teams, hardware and software usability, access to multiple delivery media, impact of organizational culture on implementation of distance learning, impact of distance learning on organizational culture, organizational costs/benefits, and evidence of institutionalization of efforts (Cronin, 1994; Newman, 1997; Steward, 1995; Schreiber, 1996).

The ultimate level of technology capability for implementing distance training is illustrated by the organization that understands the strengths and weaknesses of various delivery tools and maximizes utilization of the technology. This organization is then able to successfully institutionalize its efforts in distance and distributed learning. (See chapter three of *Distance Training: How Innovative Organizations are Using Technology to Maximize Learning and Meet Business Objectives*, edited by Schreiber and Berge, for further discussion of the strengths and weaknesses of organizational technology for distance training.)

Conclusions: Overcoming Barriers to Institutionalization of Distance Training Efforts

Corporations, government agencies, and nonprofit institutions look to distance training to provide self-paced learning opportunities and cost-effective professional development solutions to a significantly larger population of staff and customers than traditional instructor-led classroom strategies. Yet many organizations acknowledge limited return for their extended efforts. Initial training course redesigns and related materials development, as well as, establishment of new management and operational procedures, and inaccurate cost estimates, all take their toll and impact the success of distance and distributed learning. And for the organization that is mature in its technological capabilities for distance training, effective implementation of online courses and interactive television may occur, however, the company or agency wrestles with how to institutionalize its efforts so that the distance learning activities becomes part of the profile of the organization.

There are two key behaviors in which a corporation, government agency, or nonprofit organization must participate to overcome barriers to interdisciplinary efforts to maximize use of technology and institutionalize the organization's distance learning efforts. These include establishment and empowerment of an interdisciplinary core distance learning team, and development of and adherence to an organizational technology plan.

A core distance learning team provides the vehicle for increasing communication (vertically and horizontally) within the institution, providing clear explanations regarding cause-and-effect as related to technology and learning, and defining standards of performance and accountability of technology-based training. Institutionalization of distance training efforts will occur when individuals across the organization buy into and support evolving distance learning policies and procedures communicated by the core team. However, technical and non-technical staff alike must have confidence in the team and the organizational system it represents, see significant pay-off from the distance training efforts, and agree with the values and/or concepts propagated by the core team.

Although understanding the significance of collaboration among diverse experts in the core distance learning team is critical to understanding the ongoing maturation by an organization in its capability to support technology-based distance training, it is also necessary to understand corporate and government cultures as they greatly influences policy and management decisions which guide procurement and utilization of the hardware and software for distance training. Thus, development and adherence to an organizational technology plan becomes critical to institutionalizing distance training efforts.

An organizational technology plan provides policies and procedures for analyzing cost-benefits, allocating resources, and controlling budgets. It describes "how" the technology of the organization will support, facilitate, and sustain the organization's goals for web-based, interactive television, and/or other computer-mediated instruction. Also, an organizational technology plan provides a clear description of related "core costs" (the cost of doing business), and "marginal costs" (non-documented overhead or embedded costs) for at least a period of two to three years.

In concluding, remember, it is the organization with a "Stage 4" *Distance Learning Capability Profile* which exhibits the strongest success rate for designing and implementing distance training. This type of organization has evolved into an institution that facilitates interdisciplinary teamwork, understands the strengths and weaknesses of information and communication technology, manifests distributed decision-making, supports broad access to organizational technology, and is receptive to innovative budgeting strategies. The Stage 4 organization also recognizes a dynamic core distance learning team and provides comprehensive documentation of an organization-level technology plan.

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Autobiographical Sketch

Deborah A. Schreiber, Ed.D., is an independent consultant recognized for her work in designing corporate training programs which utilize communication and instructional technology for onsite and distance learning. Dr. Schreiber teaches computer-based training and distance learning at the University of Maryland, Baltimore County, and is an active member of the United States Distance Learning Association. Dr. Schreiber also participates in the National Science Foundation's panel review of Small Business Innovation Research (SBIR) program proposals.

Dr. Schreiber is coauthor of the recently published book *Distance Training: How Innovative Organizations are Using Technology to Maximize Learning and Meet Business Objectives*. Jossey Bass Publishers, Inc. Due for distribution September 1998.

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Stanford Online: The Stanford University Experience With Online Education

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Overview

Stanford University has one of the largest distance learning programs in the world, and through which the Stanford Center for Professional Development (SCPD) reaches professionals who want to pursue an advanced degree or satisfy a need to enhance their skills and knowledge while they maintain the momentum of their careers. The changing dynamics of the workplace puts employee time at a premium and pressure on educational institutions to respond to the educational demands of a rapidly evolving global business environment. Technological advances have led to the advent of asynchronous learning and a growing acceptance among educators. Utilizing this concept, and building upon the growing ubiquity of the internet, Stanford Online program makes Stanford courses, seminars, and lectures available anywhere, anytime and on demand in order to address the continuing education needs of today's busy professional.

Background

Distance learning at Stanford University has grown hand in hand with Silicon Valley, and Stanford's program has been widely considered a contributing factor to Silicon Valley's growth. The founders of Hewlett-Packard, Bill Hewlett and Dave Packard—themselves graduates of Stanford's School of Engineering—worked closely with Fred Terman, then dean of the School of Engineering, to establish the distance learning program called the Stanford Instructional Television Network (SITN). The ability to pursue graduate engineering education was, as it is now, a significant recruiting and retention tool for the high technology companies based in Silicon Valley.

Today more than 300 corporations enroll their professionals in courses and programs offered by SITN, which is the core program of the Stanford Center for Professional Development. SITN offers 200 courses each year via distance learning, and nearly all of the courses in the computer science and electrical engineering curriculums may be found on the SITN schedule. In addition to television broadcast, two-way video, and videotape, a subset of the SITN schedule is now also available via the internet through Stanford Online.

Stanford Online evolved from research on asynchronous learning at Stanford funded by the Sloan Foundation in 1994. This project was called the "Asynchronous Distance Education Project" or "ADEPT."

Stanford Online

When the Asynchronous Distance Education Project (ADEPT) at Stanford University's School of Engineering was introduced in the 1995–96 academic year, participants had the ability to take graduate-level courses on demand. This technology allowed working engineers flexibility in scheduling their professional and academic lives. While this groundbreaking effort was heralded as a significant milestone in distance education (SCPD was given "The Most Significant Advancement of Research in the Field of Distance Education" award by the U.S. Distance Learning Association), the technology itself was deemed, at best, a first step in the right direction.

In the ADEPT project, the end product for the student was a Quicktime movie with a frame rate of 0.4 fps (standard television is 30 fps) sized at 320 x 240. However, the file took up so much disk space that to accommodate end-users the course videos had to be downloaded in four 25MB segments. Dependent upon the stability and speed of the end-user's network connection, the download process was often quite taxing.

Throughout the project, simple refinements were made to enhance the viewing experience. A Quicktime plug-in became available so students could begin to view initial video files while the course was still in the process of downloading. The frame rate was increased to 1.0 fps by capturing the video in 8-bit color depth and new authoring tools allowed quicker and more consistent performance. Still, the problem of downloading files to the local disk drive and the dependency of the internet connection remained critical concerns. Furthermore, the inability to access specific points in a lecture made reviewing materials frustrating for students.

In the 1996–97 academic year, video-streaming technology became a viable option for the Stanford Online. While the major draw in Quicktime technology is its cross-platform abilities and industry-standard reputation, streaming technology allows end-users a means to view video without requiring downloading the files to computer hard-disk. Streaming video technology allows compressed video to playback without interruption by buffering segments of the file discretely. Video is played back sequentially by segment, with each played segment replaced by an incoming segment. This constant "stream" of new segments allows the video to be played seamlessly. It became quite evident that streaming technology would alleviate many of the ills that plagued ADEPT.

Stanford Online chose VXtreme and its Web Theater product family, which offers solutions to many of the components that were on the production wish list. The technology enables 10 fps streaming video which alleviates the download time and hard-disk space requirements, provides a full table of contents which allows students the ability to access the material they need without wasting time locating the pertinent material on the class video. To combat the small size of the video frame (160 x 120), the majority of the web page houses a frame called the flipper which is capable of displaying any augmenting graphics/text information in a window roughly two-thirds the size of the screen. All of the course notes are presented in a much larger frame than the original ADEPT video. Finally, all of the components are in perfect sync with one another allowing a completely interactive learning experience. When a student clicks on a specific topic listed in the table of contents, the video clip and the appropriate slide automatically load and present the requested information.

Because the streaming technology was initially only available for the Windows platform, Stanford Online chose to author classes in both VXtreme and Quicktime formats. Spring Quarter '97 showcased three courses fully authored and available on-demand and two courses that were actually streamed live using VXtreme's Live Theatre product. This enabled live streaming over the internet of some of our most popular seminars with a nominal six-second delay.

During the summer of 1998, Stanford Online will migrate to Microsoft's NetShow Services in order to incorporate much of the technologies inherent in VXtreme (which was purchased by Microsoft in 1997). NetShow will make it possible to simultaneously capture, encode and stream courses live. It will also be made available on multiple platform clients (HP-UX, Linux, Solaris, Macintosh, WindowsNT, Windows95/98, Windows 3.1x, SunOS, IRIX).

One of the most commonly asked questions asked is if the size of the video can be increased. With NetShow, the video is now fully scalable. In addition, the streaming ability is far more reliable as the client can detect bandwidth congestion and "thin" the video dropping frames between key frames, in order to maintain the video stream and ensure continuity.

Stanford Online uses Compaq Computer systems for content authoring and encoding. Hardware includes 10 Compaq Professional Workstation 6300 2D systems, each running the Microsoft Windows NT Workstation 4.0 operating system and equipped with dual 300-MHz Pentium II processors, 512-KB cache, 64-MB RAM, 4.3-GB hard disk drives, and a Winnov video capture card.

Compaq ProLiant 2500 servers are used for both the web server and the video server. Each ProLiant 2500 system runs Windows NT Server and has dual 200-MHz Pentium Pro processors, 256-KB cache, 64-MB ECC RAM and multiple 4.3-GB Wide-Ultra SCSI hard disk drives with RAID 5 protection. The Web server has seven ProLiant 9.1-GB Wide-Ultra SCSI drives with RAID 5. The servers include the Integrated Remote Console and full remote server reboot capabilities, and Compaq Insight Manager, which monitors hardware performance for early detection of potential problems.

User Reactions to Stanford Online

Stanford faculty in the School of Engineering are accustomed to teaching on television. In fact, it is expected of faculty in the departments that benefit most from participation in the distance learning program. Faculty members have found that corporate-sponsored students have brought "real world" experience to the classroom which in turn benefits the full-time campus-based student. The advent of Stanford Online has alleviated the delay inherent in the program for students participating by videotape, and the faculty has welcomed this program improvement as well.

Students on campus have taken advantage of Stanford Online as well. All classes broadcast by SITN are available on the campus network as well as on videotape in the library. Having courses available asynchronously via Stanford Online improves access for the campus student to view their courses on a more convenient schedule and eliminate long lines for videotape viewing in the library. With faculty approval, students may also register for classes that are scheduled at the same time, and participate in one asynchronously via

Stanford Online. Stanford Online has also been used to by the Stanford Overseas Program. During Spring '98, several courses were made available to Stanford students located at the Stanford overseas campuses in Berlin and Kyoto, which allowed students to stay current with their program schedule by taking classes offered on the main campus.

An average of 700 passwords are issued upon request each quarter to registered student, although campus students are not required to have passwords. Surveys reveal that 31% of Stanford Online participants would not have taken the course if it were available only online, and 84% indicated they would take another course using Stanford Online. When queried about the value of the video insert to the overall learning experience, 69% felt it contributed positively. Although asynchronously delivered education does not allow for real-time interaction, 55% of the respondents felt the lack of live, two-way interaction did not limit their ability to learn the course material. In summary, 88% felt satisfied learning the course material via Stanford Online.

The Future of Stanford Online

Future enhancements to Stanford Online will include live online 24/7 technical support through a paging technology, an online calendar, virtual problem sessions, moderated chat-newsgroup, software download wizard, online registration, virtual whiteboard integration, multiple audio tracks, variable playback speeds, closed captioning, and multiple video windows.

Combined with the growing ubiquity of the internet and widespread use of corporate intranets for training, Stanford Online technology will allow Stanford-based content to be distributed asynchronously via the network to customer organizations and corporations. Stanford Online content could be used by training organizations to enhance or augment internally-designed training programs by incorporating specific lectures, or modules of Stanford courses. A server with Stanford content could be licensed to a corporation and placed on their intranet for pay-per-view access. The Stanford Center plans to develop custom-designed instruction for professional development online delivery.

Autobiographical Sketches

Carolyn Stark Schultz is the Director of Business Development and Marketing Services for the Stanford Center for Professional Development at Stanford University. Her responsibilities include corporate outreach, development, strategic planning, marketing, and program launch. She works closely with high technology companies in the ongoing education and training of professional engineers and computer science professionals. Ms. Stark-Schultz has been at Stanford for ten years, after spending eight years at AT&T. She has a graduate degree in organization development from the University of San Francisco, and is also a graduate of Indiana University's School of Business.

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Dr. Michael Rouan is the Stanford Online Manager for the Stanford Center for Professional Development. He oversees the production and deployment of online courses originating from Stanford University. Michael has been with SCPD for eight years, and has been SCPD's course production manager assuring technical and aesthetic excellence for all broadcast productions. Prior to Stanford, he taught in San Francisco State University's Education Technology Master's program, and managed the university's cable television station. Dr. Rouan received his doctorate from the University of San Francisco in Curriculum and Instruction. He received his undergraduate degree in Radio/Television and his Master's degree in Education al Technology from San Francisco State University.

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Training, and Retaining, Faculty for Online Courses: Challenges and Strategies

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Introduction

Institutions interested in delivering courses on the web face two core challenges in training faculty to teach in this environment. First, the online environment has meant an increased need for faculty with interests and skills in this area who can master the technology, take advantage of the new pedagogy mandated by teaching in a text-based (and often non-visual environment), and maintain their subject area competence. Second, the online environment poses new challenges for the delivery of academic support services—especially online research and resources—so that faculty are sufficiently trained to take advantage of these resources in the design and delivery of their web-based courses.

At the Graduate School of Management & Technology (GSMT) we have a multi-faceted approach for dealing with these challenges: a four-phased, two semester training program; ongoing faculty support and supervision; an extensive UMUC faculty development program; and, most critically, an intense and supportive relationship with the Office of Library Services. These approaches are continually re-examined as we deal with two additional challenges: concern by faculty about the amount of "time" it takes to teach an online course, and the need to continually train/update online faculty due to new technological developments or last minute assignments.

The GSMT was established in 1978 to provide management education to the population that had been served by UMUC since its inception in 1947: working adults who attend school part-time. At present, GSMT offers 7 masters' degrees, 4 of them totally online: Master of Science in Management, Master of Science in Computer Systems Management, Master of Science in Technology Management, Master of International Management (see www.umuc.edu/prog/gsmt/dist-ed.html). Since our first online offerings in spring 96 (one course), we have grown to offering about 50 courses in fall 98 (not sections; thus the total will be greater by fall). Online courses are conducted via the web in a web conferencing system designed by UMUC (WebTycho); at present this system is primarily text-based. The task of teaching over 200 sections per semester is accomplished by a cadre of part-time faculty, most of whom have a doctorate (88%) plus extensive management experience. GSMT has about 3500 students and 250 faculty in its ranks.

Training GSMT Faculty

Since the creation of the Distance Learning & Instructional Technology office in July 1997, an extensive faculty training program (FTP) has been developed. The FTP has four phases: 1) initial training and homework—this occurs over 3 weeks during the semester, and covers both the technology and pedagogy, applied assignments, intensive discussion of DE teaching issues from a student and then faculty perspective; 2) observing an experienced instructor and writing an observer's memo, and working in a "practice" class for the remainder of the semester; 3) mentored teaching with feedback, by an experienced online instructor, during the first semester of teaching; 4) participating in an online discussion group mid-way during the first teaching semester. Successful completion of phases 1 and 2 (initial training, shadowing, practice class) results in a "Training Certificate"; completion of phases 3 and 4 results in a "Teaching Certificate." It should be noted that the FTP is part of a larger project, the Continuous Learning Program for Distance Faculty.

In addition, GSMT provides support and supervision to its online faculty by the use of "course managers"(full-time faculty/administrators) who design the master syllabus (required for the course), hire adjuncts, provide guidance and support, get textbooks and other materials for the instructor, do site visits (online this means "shadowing" the part-time instructor), assist with student problems and facilitate dealing with the usual administrivia; local faculty also meet early in the fall and spring semesters for an all-hands-on-deck faculty meeting; extensive faculty development opportunities are also available at no charge (see discussion below). The bonds between GSMT and its part-time faculty is so strong that many of the instructors have been with us for over a decade!

GSMT "Time" Research

The advent of technology and the online environment has, despite the support noted above, raised some strong concerns among our faculty about the amount of "time"it takes to teach an online course and what elements are involved. To deal with this issue, we began a pilot research in 96–97 among the group of online instructors (*n* = 9); in 97–98 we formalized the study to include both online (*n* = 29) and in person (*n* = 49) classes. [note: *n* = number of respondents, not total faculty/sections offered] The results, so far, indicate that while web classes are smaller (median 23) than in person classes (median 30), web faculty spent about 2–5 hours more per week in their classes than in person faculty. Some of the areas which account for differences in web class time when compared to in person classes, are the amount of time grading exams (median 2.5–3 hours online; .5–1 hour in person), the amount of individual contact between student and teacher (median 3–2 hours online; .5 each semester in person), obtaining additional resources for students (median 1.5 hours online; 1 in person). The greatest contrast was the amount of time faculty spent on developing their courses—online faculty spent 2½ to 3 times longer (median 50–40 hours online; 18–17 hours in person).

Several caveats are necessary with respect to this data: first, this is self-reported data and thus depends on the memories and perceptions of the respondents; second, the surveys were distributed at the end of the semester and are thus subject to a possible "recency" effect; third, the number of respondents remains too small for statistically significant conclusions at this point. Nonetheless, these data indicate patterns which bear watching and issues which need continued attention.

Retaining Online Faculty

Another challenge with which we are confronted is the need to retain and retrain online faculty, despite any concerns about time or changing technology. We do this by having course managers work closely with their faculty in teaching selections, by offering a stipend for the training and for the teaching online, by providing refresher (updated) training sessions at GSMT, and by working closely with UMUC's Faculty Development Office in providing more than 30 onsite and online workshops at no charge to the faculty. These workshops focus on four major themes: globalization, computer literacy, information literacy, effective writing. This past year UMUC has offered programs about Issues in Fair Use of Web Resources, Enhancing Student Interactivity, Getting Published on the Web, Designing Effective Assignments to Build Information Literacy and Writing Skills, and so on.

However, the most effective, most up-to date and most beloved workshops are those designed and lead by our colleagues in the Office of Library Services (OLS). These workshops include Information and Literacy Across the Curriculum, Introduction to Online Research, and Searching the Web. And this fall, we begin a new joint venture: a required course (for new students and faculty) on using online library resources.

Educating Faculty About Online Library Resources

The University of Maryland University College faculty are predominantly part-time and scattered throughout the United States, Europe, and Asia. The time constraints faced by part-time faculty coupled with the issues of distance, pose two significant barriers in teaching our faculty about online library resources. A third challenge in teaching UMUC faculty is the fact that the Office of Library Services delivers the majority of its services via the Internet and faculty vary widely in their knowledge of, access to, and use of the Internet. Unlike the traditional course on a college campus, where use of electronic library resources is a matter of choice, the online environment requires faculty to be versed in using online resources. If faculty are not knowledgeable in the use of online library resources, it is frustrating for faculty because it makes it difficult for them to assist students who must complete a research paper in almost every online graduate course. Once faculty are introduced to the use of online resources they are able to help students conduct research more effectively and students are more interested in and engaged in the research process. Therefore, OLS, in conjunction with the GSMT, has developed a comprehensive training program to assist online faculty to use these resources.

Library Workshops

Initially, OLS offered a series of voluntary in-classroom workshops on using online library resources, focusing primarily on the online catalog, and web-based, citation, abstract, and full-text journal databases. These courses were limited, however, to faculty in the local area and as a result could not serve the majority of faculty. Therefore, one year ago, OLS launched a series of Web-based workshops including one on using the proprietary, full-text online library resources, one on using the "free" resources on the Web, and a third on how to develop writing and research assignments using online resources accessible to students taking a course in the online environment. In some cases the courses are for beginners and in others, the courses build on each other and faculty are encouraged to take the workshops in sequence. If faculty choose not to take the courses in sequence, we also publish prerequisites for the workshop (e.g., familiarity with a Web browser such as Netscape).

To date, 240 faculty, located on three continents, have participated in at least one workshop, and the demand for these workshops continues to grow. Faculty have found the workshops an excellent alternative to the traditional in-classroom faculty development workshop format. The workshops are a combination of computer-mediated conferencing, electronic mail for announcements and one-on-one interaction, and a series of modules with exercises that faculty complete at their own pace. It is our expectation that faculty will commit five hours to complete the requirements of the online workshop and share their experiences doing the exercises and participating in the workshop with their colleagues. Each workshop is scheduled for one week. However, course materials are made available for one month after the official end of the workshop including telephone and online access to the instructor. Afterwards, faculty have the option to use the course materials indefinitely.

The appropriate length for these workshops is still under debate. Some faculty would like them to be longer. However, we initially offered the workshops over a period of two weeks and found that participants started to disappear after the first week. As a result, we are using one week as the basis for development of the modules and for determining the length and complexity of the exercises.

The Online Library Resources Course

In addition to the voluntary workshops available to undergraduate and graduate faculty, the Graduate School decided that new students and new faculty need to have an introduction to the online library resources. This decision was based on the discovery, through our regular surveys of students, that students are unaware of the wide range of online resources that are available to them. Therefore, the faculty member plays a crucial role in introducing students to online resources. Further, providing faculty an introduction to online library resources makes it possible for them to utilize these resources in the design and delivery of their course. In addition, faculty have the opportunity to learn what their students have access to. As a result, they can develop assignments that students can successfully complete and thereby ensure their expectations for student research are realistic. In response to the need to set up a course that would give students and faculty a solid introduction to online library resources, OLS developed a non-credit, required online course for new graduate students and faculty. The course is entirely on the Web, using UMUC's Web-based instructional management system, WebTycho. It is self-paced, and self-assessed. In order to assure that the course meets the needs of the students and faculty, the course content was reviewed by the full-time faculty, some part-time faculty, and a select group of students before the final version was developed.

The course provides an in-depth introduction to doing research online and using UMUC's electronic library for research purposes. The course uses a combination of computer-based conferencing, lectures, and exercises to help faculty and students learn about online resources. In addition, the course includes a series of online quizzes that are generated and evaluated by a computer program and therefore, students get immediate feedback on their grasp of the concepts covered in the course and if they fail to perform adequately, are directed back to the portions of the course they were deficient in for further study and review.

The course does not have a formal instructor. However, if faculty or students do have questions, the library's reference staff are available to provide assistance in completing the various modules.

Course Delivery and Evaluation

The course is scheduled for formal delivery in the fall semester of 1998. Systematic evaluation of the course will continue. We expect that the course will be under revision on a regular basis. The primary reason is that the number of online resources UMUC offers is constantly growing and the new resources need to be added to keep the course content current. The library has assigned one staff member to spend forty percent of her time updating and maintaining the course. We have discovered that development of the course is only one part of the process and the need to continually monitor and update the course is another time consuming part of the process. In addition, we are not yet sure the extent to which faculty and students will be able to complete the course without any outside assistance. We plan to keep detailed statistics on the number of faculty and students who contact the librarians and the types of problems they encounter to determine where there may be problems with course delivery and to evaluate whether an instructor is needed. We are hopeful that the Web-based format will offer faculty and students flexibility in taking the course and provide a solid introduction to research and using online resources to ensure faculty and students all begin with a basic understanding of the research tools available and they will be skilled in evaluating the quality of the resources they use.

Autobiographical Sketches

Dr. Claudine SchWeber is currently Director of Distance Learning and Instructional Technology at the Graduate School of Management & Technology (GSMT) of the University of Maryland University College, and an adjunct Professor of Management. She is a specialist in conflict management and has done training, teaching, and writing in this field for over a decade. In recent years she has written about the use of technology in conflict management, especially as it impacts those at great distances or those with disabilities. Dr. SchWeber is a certified mediator of disputes under the American with Disabilities Act. Prior to joining GSMT, Dr. SchWeber was the training director for the Council of Better Business Bureaus in the Mediation-Arbitration Division and earlier a research assistant in the District of Columbia Superior Court. Before that she was Associate Professor of criminal justice in Buffalo, New York—a field of work which literally drove her to look for better solutions to resolving conflicts. She is the author of one book, more than 25 articles, testimony before the United States Congress, and over a hundred presentations; she also volunteers as a mediator, an Ethics Commissioner in her city, and the board of directors of a foundation dealing with issues related to the ADA. All of these activities make her yearn all the more for the time to be with her family, to travel, go hiking and camping, and finish the quilt she started 3 years ago!

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Dr. Kelley has her Bachelor's degree in animal behavioral psychology, a Master's Degree in Information Science from Emory University in Atlanta, Georgia, and a Ph.D in Education from the University of Maryland, College Park. The topic of her dissertation and current research interest is the influence of discipline on faculty use of the World Wide Web (WWW). In her professional life she is the Director of Library Services at the University of Maryland University College (UMUC). Prior to coming to UMUC, she was the Chief Librarian for the Museum Support Center at the Smithsonian Institution and Head of Reference and Collection Development for the Engineering and Psychology Libraries of Columbia University in the City of New York. She has published on the use of technology in libraries and is a frequent speaker on the use of the Internet, WWW, distance education and libraries. Most recently, she developed a graduate library research skills course for the Web, delivered a series of faculty workshops on using electronic library resources through UMUC's Web-based instructional management system, Tycho, and is currently developing a Web-based, one credit course on library research for UMUC's Undergraduate Programs.

Gloria J. Orr is the Associate Director in UMUC's Office of Library Services. Ms. Orr is responsible for providing resources and services to UMUC's distant students, overseeing operations at an off-site library, coordinating the libraries' collection development program, and monitoring circulation activities. She has been involved in teaching students and faculty how to access electronic resources, and contributed to UMUC's handbook on library services and UMUC's guide on writing and research. She has published an article in an American Library Association journal. Ms. Orr has a B.A. in Asian Studies from Florida State University, a M.A. in South Asian Studies from the University of Wisconsin, and a M.S. in Library and Information Science from the Catholic University of America.

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CMC Environments Designed to Facilitate Multiple Levels of Interaction

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The challenge in distance education today is not so much delivery of content, but how to use the new tools available for the Internet to design effective and efficient communication environments. These communication environments need to be able to support students' interactions with the instructor, interactions with peers, collaborative work areas, and real time interactions. They need to not only do this for individual courses, but for full programs of study. For many years we have focused on designing environments around individual courses (Wells, 1992) and the on-line tools, either Internet based or those within earlier systems such as PLATO (Szabo, 1995), were adequate for facilitating communication within individual courses. However, as distance education continues to move into the mainstream and more institutions explore the possibilities of offering full degree and certificate programs on-line, more robust communication environments must be developed. These environments will need to facilitate interactions with the institution's administrative offices, academic departments, faculty, and the students.

The Pennsylvania State University through its World Campus is exploring several design models which provide these multifaceted communication environments. Currently, students enrolled in programs offered through the World Campus are interacting with courses delivered through WebCT, a course management tool produced by the University of British Columbia, or through FirstClass, a communication tool marketed by SoftArc out of Toronto, Canada. Both of these environments provide students with a range of tools that are used throughout their course of study. While WebCT is more course specific, the FirstClass environment allows us to custom design the interface to support the full curriculum. Thus, students have access to a single communication environment which not only supports individual courses, but provides an interface to the whole curriculum. This includes the ability to communicate with the World Campus Learner Support, the administrative support unit for applications, registration, financial aid, and ombudsmen for the students.

The FirstClass Environment

One of the Penn State World Campus programs which is designed around FirstClass is the Program in Noise Control Engineering (NCE). The NCE Program is a four course certificate developed to provide engineers in the field with both the theoretical and practical knowledge required to address noise and vibration control problems in industry. Each course in the NCE program consists of a CD-ROM, a Resource Notebook, simulated measuring instruments, and mathematical graphing software, all of which are integrated around the FirstClass environment.

Within the FirstClass environment for NCE (see Figure 1) students have access to standard tools such as private e-mail and the Help public conference area, as well as private conferences and chats set up especially for the particular cohort of students. In Figure 1 you will notice that four course conferences have been set up, one for each course in the certificate program. Within each of these conferences is a series of sub-conferences which aggregate threaded discussions specific to the particular unit or lesson the students are working on. At the center of the student's FirstClass desktop is the Instructor's Office, which is a private conference area for the cohort and serves as communication space where students and the instructor can post messages related to a specific course or the certificate in general. Students may also post messages to the World Campus administrative units through private e-mail or may interact with World Campus support through the Tech Support Conference. This functionality allows individuals from both administrative and academic units to have access to the students and be able to respond to technical questions concerning not only technical operations, but issues associated with programming input into software packages like MatLab, which tutors in the academic unit assist with.

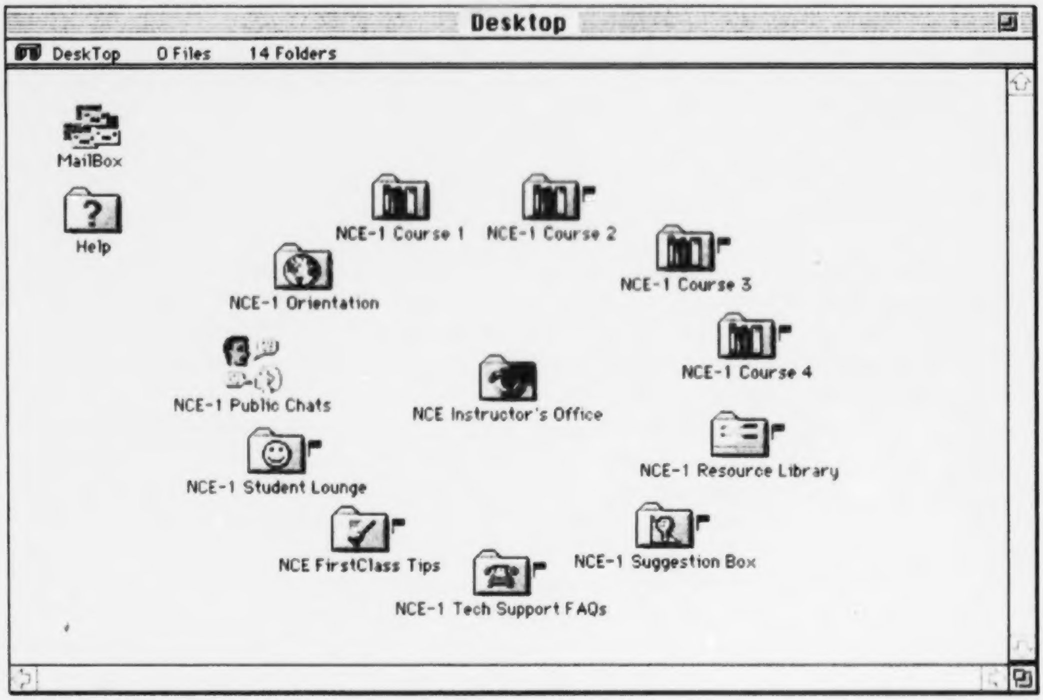
Desktop
DeskTop
0 Files
14 Folders
MailBox
Help
NCE-1 Course 1
NCE-1 Course 2
NCE-1 Course 3
NCE-1 Course 4
NCE-1 Orientation
NCE-1 Public Chats
NCE Instructor's Office
NCE-1 Student Lounge
NCE-1 Resource Library
NCE FirstClass Tips
NCE-1 Suggestion Box
NCE-1 Tech Support FAQs

Figure 1

This particular FirstClass environment is designed to support students from the time they are officially enrolled in the certificate program through the completion of the final comprehensive exam. It also assures that students and faculty will have access to discussions which may develop over all four courses, especially as they are related to the collaborative assignments.

Collaborative Workspace

Students enrolled in each course in the NCE Program are required to collaborate on a major project which is interwoven between all four courses. To facilitate the collaborative teams each course conference area has a collaborative conference space (see Figure 2). The FirstClass permission structure allows one to establish collaborative workspace for each team which is secure and to which only the team members and the instructor may have access. In this way one can have all teams in a course working on a similar project, but each team will only have access to their work in progress and will not be able to see the interim reports/interactions of the other teams. In the case of the NCE Program, where the collaborative projects are interwoven between four courses, the FirstClass environment also allows students to review their work from the previous courses.

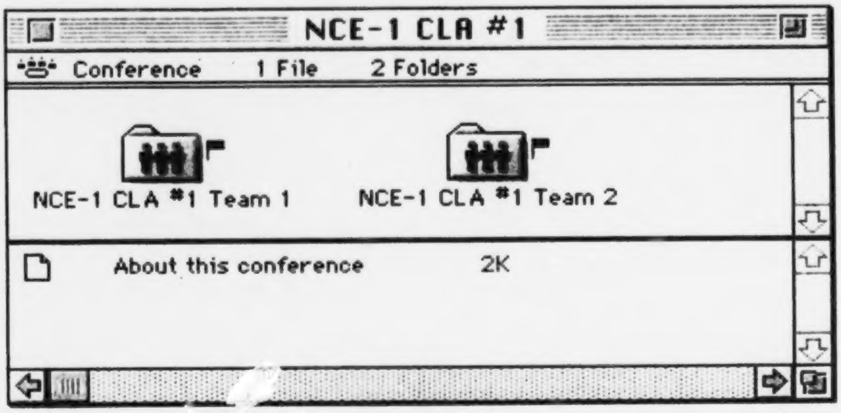

Figure 2

Level of Interactions

The sub conferences within each NCE course conference are broken down by unit and lesson. Within course one, for example, there were five units and within each unit five lessons. As a part of each lesson there are a series of study questions which the students are to respond to prior to starting a lesson. They are then asked to revisit these questions at the end of the lesson. The intent here is for students to interact with each other and draw upon the thoughts of their peers. These conferences also allow the faculty to monitor the discussions and interact where appropriate with the group. Each lesson also contains individual learning activities that students have to complete. Here they are encouraged to work together on the problems and draw upon each others strengths.

As the first course in the program has just ended we do not have quantifiable data, but we do have some preliminary observations on level of interactions. It was interesting to note that most students simply posted their responses to the study questions and did not read the responses of others. However, there were several occasions where we noted that students who were having difficulty with a particular problem often reviewed the posting of others prior to contacting the instructor. It is also important to note here that these postings were not graded, so the level of interaction/posting was not as high as we witnessed in the collaborative learning activity. In the collaborative learning activity we saw a large number of postings and discussion going on as the student teams worked on the assignment. It was interesting to also note the number of students who utilized the private chat capability of FirstClass to discuss project issues and to simply support each other through the process. As one student stated:

> I think the chat capability also encourages more personal interaction among the students. I think several of us have had some trying times personally and professionally this semester, and I think the mutual support network has been very helpful to some of us.

With regard to the level of interaction required for the instructor, we observed that he was usually on-line five days a week for a total time of five to seven hours per week. The instructor made a conscious effort to read all messages and respond to all questions with appropriate feedback for the students.

Faculty and Student Perceptions

Although the end of course evaluation has not been analyzed, impressions of the learning experience, as gleaned from the interactions and notes sent to the designers and learner support, would indicate a general level of satisfaction with the course. As expected, some students experienced intermittent problems with their ISP connections and subsequently their FirstClass connection which piggybacks on the IP connection. Also, a few students felt that they needed more orientation time to familiarize themselves with the communication environment and develop a comfort level for knowing where to post certain concerns or questions.

From the instructor's view point, he indicated that he truly enjoyed the experience and stated that he was able to interact with individual students more in the on-line environment than in a traditional resident model. He also mentioned that he felt he became closer to the students in terms of knowing their backgrounds and desired goals for the course. The instructor specifically mentioned how well the collaborative learning activity went and how thrilled he was with the quality of the final projects. This sentiment was echoed by several of the students. The instructor has, however, questioned the time required to adequately interact with a larger group of students and is cautious about having an enrollment of more than thirty in a single course within the program.

Discussion

The instructional design team and members of the World Campus learner support at Penn State feel that the early feedback and level of student satisfaction is very positive. While we recognize that the FirstClass learning environment for the NCE program needs to be modified, based on feedback, the general consensus is that it has functioned well and their were few technical problems after the first two weeks of orientation and introduction to the course. While we are still in the early stages of delivery of the certificate program it will be interesting to witness how the environment performs for the students and faculty through the next three courses in the program.

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Autobiographical Sketches

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Learning Strategies and Other Factors Influencing Achievement via Web Courses

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Introduction

As the popularity of the World Wide Web (WWW) increases, its use as a means of delivering instruction is also growing. The World Lecture Hall lists almost 700 courses that are delivered by higher educational institutions via the Web, and this list is growing daily (Parson, 1998; World Lecture Hall, 1998). Alexander (1995) believed that "the greatest potential of the Web, however, lies in the fact that we have a chance to learn from the lessons of the previous faded technologies, and an opportunity to develop new learning experiences for students that have not been possible before" (p. 3). However, Parson (1998) and Alexander (1995) argued that while implementing a new technology, educators should evaluate how students learn via the new technology so as to help with curriculum and instructional designs. Parson (1998) added that it is important to understand how the new technology can affect learning when it is used by different types of learners.

Identifying students' learning styles helps educators understand how people perceive and process information in different ways. Garger and Guild (1984) described learning styles as "stable and pervasive characteristics of an individual, expressed through the interaction of one's behavior and personality as one approaches a learning task" (p. 11). Literature (Witkin, Moore, Goodenough, & Cox, 1977; Raven, Cano, Garton, & Shellhamer, 1993; Miller, 1997a; Miller & Honeyman, 1997) on learning styles suggests that field-dependent learners tend to approach a problem in a more global way, are socially oriented, prefer collaboration, and are extrinsically motivated. In contrast, field-independent learners tend to approach a problem more analytically, rely on self-structured situations, prefer competition, and are intrinsically motivated.

Like the literature on learning styles, the literature on learning strategies explores different ways of learning. However, in assuming stability as well as lack of individual control, learning style literature suggests that it may be difficult for students to change their learning styles, whereas learning strategy literature assumes that students' use of learning strategies can be controlled by learners and changed through teaching (Pintrich & Johnson, 1990). According to Cross and Steadman (1996), cognitive learning strategies are methods learners can use to improve their understanding, integration, and retention of new information. Learning strategies include a wide variety of cognitive processes and behavioral skills (Weinstein & Keyer, 1991). General learning strategy components include rehearsal, elaboration, organization, comprehension, metacognition, and resource management (Weinstein & Keyer, 1991; Cross & Steadman, 1996).

Miller (1997b) identified twelve learning strategies used by the students studying agriculture through videotapes. Pausing the tape while viewing and taking notes was the most used learning strategy by the students taking videotape courses. Miller defined learning strategies as "the techniques or skills used by an individual in accomplishing a learning task" (Miller, 1997b; p. 21). His definition is different and not as broad as the definition in Mayer's study (1988). Mayer defined learning strategies as "behaviors of a learner that are intended to manipulate a person's cognitive processes during learning" (Mayer, 1988; p. 11).

In their study on relationships between learning strategies and learning styles in a hypermedia environment, Liu and Reed (1994) used the term "patterns of learning" in discussing learning strategies. In Lui and Reed's study, patterns of learning were measured by identifying how often the students accessed different functions in a hypermedia environment and how long students used the courseware, which seems to be quite similar to Miller's (1997b) definition of learning strategies. Liu and Reed (1994) found that different learning style groups employed different patterns of learning in completing the same task.

What do we know about the way students learn through the new technology, the WWW? What are the important learning factors in Web-based courses? Do student learning styles, learning strategies, and patterns of learning influence learning achievement? Research is needed to obtain more understanding of the learning factors that influence students' success in Web-based learning. Moreover, research is needed to understand student learning strategies and patterns of learning with different learning styles via WWW. This type of research will assist educators in planning, organizing, and delivering quality Web-based instruction in a manner that will improve student learning.

Purpose and Objectives

The purpose of this study was to examine how students with different learning styles functioned in Web-based courses that were offered by Project BIO at Iowa State University, and to determine what factors influenced their learning. The objectives of the study were to identify: (a) the demographic characteristics of the students by learning styles, (b) how students' learning strategies, patterns of learning, and achievement differed in relation to their learning styles, and (c) relationships among student learning styles, learning strategies, patterns of learning, achievement, and selected variables.

Methods and Procedures

The population for this study included 99 students taking the two non-major introductory courses, Zoology 155 and Biology 109, offered by Project BIO at Iowa State University in the Fall of 1997. Theses two Web-based courses developed through Project BIO were stand-alone courses in which most course materials and resources were accessed and delivered by the Internet.

An on-line questionnaire was designed by the researchers and included two scales plus demographic questions. The questionnaire, written in HTML format, was posted on the web. Thirteen statements representing the learning strategies scale were selected from a learning strategy instrument, Motivation Strategies for Learning Questionnaire (MSQL) developed by Pintrich, Smith, Garcia, and McKeachie (1991). The students were asked to rate themselves according to how well the statements described them while they were taking the Web-based course by using a five-point Likert-type scale. The scale had response options from (1) Not at all typical of me, (2) Not very typical of me, (3) somewhat typical of me, (4) Quite typical of me, to (5) Very much typical of me. Fifteen statements representing the patterns of learning scale were developed by the researchers based on the techniques or interactive functions in the Web-based courses that students used to accomplish a task. The five-point Likert-type scale had response options ranging from (1) None of the time, (2) Part of the time, (3) Some of the time, (4) Most of the time, to (5) All of the time. Demographic variables included courses previously taken in the subject area, study and work hours per week, class level, and gender.

Content and face validity for the questionnaire were established by a panel of three faculty members associated with Project BIO and three graduate students in Agricultural Education. The Likert-type scales were pilot-tested for reliability with 38 students taking a different undergraduate Project BIO Web-based course, Biology 201. Cronbach's alpha coefficients were .80 and .73 for the learning strategies, and patterns of learning scales, respectively. The researchers administered the learning style test (GEFT) to on-campus students and the off-campus students were administered the GEFT by their proctors. The reliability coefficient for the GEFT was .82 (Witkin, Oltman, Raskin, & Karp, 1971).

A total of 78 (79%) students completed the GEFT. An on-line questionnaire was posted on the web three weeks before the final exams. A follow-up electronic letter to nonrespondents of the on-line questionnaire yielded a total of 94 responses for a 95% return rate. Nonresponse error was controlled using responses from those students who completed the GEFT after the deadline for taking the learning style test. For purposes of analysis, the learning style (GEFT) scores, questionnaire responses, and students' grades, which were provided by the instructors at the end of the semester, were matched. Respondent and nonrespondent data were pooled yielding a total number of 74 (75%) responses.

Data were analyzed using the Statistical Package for Social Science, Personal Computer Version (SPSSx/PC). Analyses of data included frequencies, means, standard deviations, t-tests, Pearson and point biserial correlations, and regressions. The alpha level was established *a priori* at the .05 level.

Results

The usable responses included 29 (39%) in the Zoology class and 45 (61%) in the Biology class. Less than half (29; 39%) of the usable respondents were males. Twenty-eight (38%) were high school students and forty-six (62%) were university students. More than two thirds (51; 69%) of the respondents were field-independent learners. On average, the students had previously taken 1.45 courses in the subject area of Zoology or Biology. The students spent an average of 3.27 hours per week studying, ranging from 1 to 20 hours and worked an average of 16.97 hours per week, ranging from 0 to 80 hours. No significant differences by learning styles were found in the number of courses taken previously, study hours per week, or work hours per week.

Field-dependent students (mean = 3.27) had almost the same mean on the learning strategy scale as did field-independent students (mean = 3.25), and no significant difference was found in the t-test when comparing their use of learning strategies. Moreover, four mean scores of the thirteen learning strategy items were rated above 3.50. The highest-used learning strategy was to find the most important ideas from lectures (mean = 3.85). The second most highly used strategy was to memorize key words of important concepts (mean = 3.76). The third most highly used strategy was to relate the material to what they already know (mean = 3.70). The next most highly used strategy was to determine the concepts they did not understand well (mean = 3.68). The two lowest used strategies had mean scores under 2.50. They were "to give up the difficult parts and study the easy" (mean = 2.16) and "make charts or tables to organize the material" (mean = 2.14). The overall mean score for students' use of learning strategies was 3.25 with a standard deviation of .51.

Although field-dependent students (mean = 3.00) indicated that they spent more time based on their patterns of learning in Web-based courses than field-independent students (mean = 2.83), no significant difference was found. Six patterns of learning were rated above the mean score of 3.50. They were: check scores of the tests or assignments (mean = 4.54), view the slides (mean = 4.19), listen to the audio of the lessons (mean = 3.95), check the answers of the tests or assignments (mean = 3.93), read course handout package (3.70), and take notes while listening to the audio of the lessons (mean = 3.58). Five patterns of learning were rated below the mean score of 2.00. They were: listen to the audio more than once (mean = 1.84), communicate with the class via e-mail (mean = 1.82), communicate with the class via discussion net forum (mean = 1.80), use the CD ROM disk accompanying the textbook (mean = 1.47), and communicate with the class via chat net forum (mean = 1.47). The overall mean for how often students used the patterns of learning in Web-based courses was 2.88 with a standard deviation of .53.

Although field-independent students' standardized achievement (mean of z-score = .06) was higher than field-dependent students' (mean of z-score = .14), the results of the t-tests showed that no significant differences were found on the respondents' overall achievement scores by learning styles.

Pearson correlations and point biserial correlations were used to describe associations between student standardized achievement score and selected variables. Nine relationships were examined that ranged in magnitude from substantial to none. The relationship between the two variables, student achievement and learning strategies, (r = .50) was significant. No significant relationships were found between student achievement, gender, Web-based courses they were taking, whether or not they were university students, previous experience in the subject areas, hours per week studying and working, and learning style scores.

A hierarchical regression analysis was conducted to ascertain the amount of variance in students' standardized achievement scores by the variable of interest. The regression model was loaded first with the learning strategies variable, which explained 25% of the variance in achievement. The patterns of learning variable was entered next into the regression. This variable did not explain any additional variance in student achievement. Then the learning style variable was entered into the regression model, and it explained an additional 2% of the variance in student achievement. Learning strategies was the only significant variable for the explanation of variance in achievement scores.

Conclusions/Recommendations

Student learning styles, patterns of learning toward Web-based instruction, and student characteristics (whether or not they were university students, gender, previous experience in the same subject area, study and work hours/week) did not have an effect on their Web-Based learning achievement. Moreover, field-independent students did not differ from field-dependent students in their learning strategies and patterns of learning in Web-based courses. The conclusion was that different types of students using different learning strategies and patterns of learning with different learning styles can learn equally well in Web-based courses.

Students were slightly positive about the use of learning strategies and were around midpoint in their frequency of use of learning patterns in Web-based courses. Trying to find the most important ideas from lectures and memorizing key words of important concepts were the two highest-used learning strategies; checking scores of tests or assignments and viewing the slides were the two highest-rated patterns of learning. Students used least the learning strategies of making charts or tables to organize the material. They used least the patterns of learning of communicating with the class via e-mail, discussion net forum, and chat net forum. It was concluded that students used more rehearsal and elaboration learning strategy and less organizational learning strategy. And they used more patterns of learning in studying the course information and checking their grades than in communicating with the class. The researchers recommended that educators should provide students with learning opportunities by using a variety of learning strategies to assure students' understanding, integration, and retention of course concepts. Additionally, educators should encourage students to use more of the communicating techniques or functions, such as e-mail, discussion and chat forums, for more interactive learning in Web-based courses.

Learning strategies seem to be the most important factor in Web-based learning and accounted for one fourth of student achievement. Use of learning strategies by the students correlated significantly with student achievement. The higher the student scored on a general use of learning strategies, the higher the student's overall achievement in the class. This was supported by Pintrich and Johnson (1990), and Weinstein and Underwood (1985). They indicated that students use more learning strategies usually learn more than students who use few of the strategies. Additionally, they also believed that learning strategies can be controlled by learners and improved through instruction. It was recommended that educators should assist students in understanding and mastering different learning strategies to help them becomes better learners.

Further study is needed to identify learning strategies and patterns of learning between high achieving and low achieving students in Web-based courses. Are the most highly used learning strategies used by the highest achieving students? Are communication functions used by the high achieving students? These are questions that need to be answered as Web-based instruction becomes more and more common.

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Faculty Compensation Issues in Distance Education

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As distance education programs continue to grow at tremendous rates throughout the country, many institutions of higher education are looking for cost savings benefits from the introduction of the newer technologies into the teaching and learning environment. Faculty appear to be taking a variety of positions: some jumping in and offering courses in a variety of formats utilizing a variety of technologies; other faculty are dipping their toes in the water of technology utilization in their teaching and are intrigued by what they find; still others lag behind at the shore, hesitant to commit and change their current patterns of delivery and confused about what the distance education movement holds in store for their faculty position.

For all of these faculty, key concerns center on compensation. Initially, for their efforts in development, but also concerns about compensation for their retraining/retooling to be able to develop and deliver these new courses; how will faculty be selected to teach and what role will a faculty member play if they do not embrace these new approaches. Other key issues focus on compensation for delivery of instruction in a format that does not require them to be physically present, does not require them to perform the same tasks as before, or even to "teach" in some cases. Institutions involved in distance education are at various stages of sophistication in addressing the issues that revolve around compensation and distance education. Traditional methods of determining workload and compensation do not necessarily make the transition to the newer models.

Institutional Background

College of DuPage is the largest single-campus community college in the United States; located west of Chicago, serving 900,000 district residents; enrolling 60,000 students per year; Fall quarter enrollment was 33,490 students. The College has been offering distance education and alternative learning programs for over 20 years. Currently over 6,000 students enroll in its telecourses, appointment-based/open lab courses, broadcast courses (radio and television), interactive video/audio courses, internet delivered courses, and independent study courses. The College's 5 Centers for Independent Learning (main campus, and 4 community centers) provide 141 different courses, in 641 sections for more than 30 disciplines each quarter. The relatively new internet/online courses are delivered through COD OnLine and will offer 15 online courses for Fall 1998. The college has 7 interactive video-audio classrooms (3 on main campus and 4 in the community) and serves as the hub for a consortium of 30 college, university and high school locations.

Methods of Identifying Key Issues

During our 1995 contract negotiations one of the key issues identified for negotiations was the compensation for faculty teaching in the distance education programs at the college. It was determined as the negotiation team began to address this issue that to do the issue justice and have a more lasting arrangement the issue could not be addressed in the timeframe allotted for the current contract negotiations. It was proposed and approved that a committee be established to serve as an ongoing exploration and negotiation team to address the issue of emerging technologies and their impact on faculty teaching at the college. The proposed contract language is attached and states our definition of alternative delivery formats and the role of the study and advisory committee. This definition and statement of role was not easy to come by. In a review of contracts addressing distance education, as well as through queries on distance education listservs, we found a wide range of definitions. We also discovered that we were not unique in concluding that an ongoing team to study and advise on compensation issues relating to distance education was the most appropriate approach.

Once our committee was established, we attempted to determine the current state of the contract and identify areas that might be impacted by emerging technologies. The attached list identifies 15 contract areas that we committed to review. The team also attempted to cluster related issues, as well as prioritize items based on our working knowledge of the current system. The top issues were Intellectual Property Rights related to development of distance education courses, Faculty Workload for teaching distance education courses, and a third issue not currently a part of the contract, defining the responsibilities and compensation for maintenance of distance education courses.

To get a better sense of where faculty and administration stood on these issues, open forums were held to discuss these issues as well as others that were cause for concern. A notice went to all faculty and administrators; included for background reading were articles from various sources (AFT, NCA) that we hoped would serve as food for thought. From these forums more refined questions emerged that centered on the three issues the team had previously identified as priority items. The Emerging Technologies Committee then decided to continue the forums by slating one committee meeting each quarter as an open meeting to continue the discussions. The topic for the Spring open committee meeting was more structured and focused on the specific questions and the language of the contract relating to Intellectual Property Rights; the summer and fall quarter sessions will focus on faculty workload issues. The committee meets to finalize the contract language and submit proposed changes in the contract to the faculty and administration for final approval.

This approach has worked well thus far. We have identified key issues, sought involvement from constituency groups and continue to work to develop contract language that addresses the issue of emerging technologies in education.

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Definition of Emerging Technologies and Alternative Delivery Formats

The traditional delivery of education occurs when the majority of contact among instructor and students in a course is synchronous, face-to-face, and observes traditional contact hours for a defined academic term. All other instructional programs not included in this definition are considered to be emerging technologies and alternative delivery formats.

Study and Advisory Committee

The Association agrees to participate on a committee composed of three Faculty Members and three Administrators. The committee will be charged with reviewing practices related to preparation, performance, working conditions, and remuneration with respect to emerging technologies and alternative delivery formats. The committee will make recommendations in the spirit of the contract as changes impact teaching and learning at the College.

It is agreed that the goal of this action is to establish a committee for continuing review of the impact of emerging technologies and alternative delivery formats on the teaching and learning environment at the College. This review will seek to maintain a progressive, integrative approach to incorporating these emerging technologies and alternative delivery formats into the college curriculum. Any contractual changes are subject to approval by the Association and the College.

Issues to be reviewed by the Emerging Technologies Committee include but are not limited to the following:

- Program Approval
- Academic Freedom
- Intellectual Property Rights
- Academic Year
- Assignment of Faculty
- Work Week
- Duties of Teaching Faculty
- Program Coordinator Assignments
- Summer Assignments
- Continuity of Practices
- Intellectual Property Rights

- Marketing of Instructional Materials
- Ethics Policy
- Large Group Classes Policy
- Instructional Design Agreements

Autobiographical Sketches

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Re-Tooling for Re-Training: "Flexible Control" Is the Key to Building an Online Statewide Training Support System

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Many agencies are implementing distance education technologies to reduce the collateral costs associated with traditional in-service training. In the process they face many entrenched planning complexities. Our experience retooling the Wisconsin Department of Workforce Development's Division of Economic Support may provide insight into the approach other organizations should take when they initiate distance educational systems. We will: (1) discuss our initial approach which emphasized "flexibility" in planning the retooling process, (2) illustrate the modification and design model used by the Wisconsin Department of Workforce Development and UW-Stout to bring a "library" of computer-based training programs online, and (3) assert that "flexible control" over key elements of development is essential to the realization of planning goal.

Flexibility Required

Introduction/Background

Wisconsin's Department of Workforce Development, Division of Economic Support, Training Section (DES) is a leader in the use of computer-based training (CBT) for local agency staff. DES used CBT extensively from 1994–1997 to implement the CARES and KIDS automated systems for economic and child support programs. With the legislative mandate known as Wisconsin Works (locally called "W-2") over 4,000 individuals needed to be provided with in-service training in a very short time frame using an initial balloon of quickly diminishing dollars. The time seemed right to build a "library" of CBT products that could be delivered online to staff located in every county in the state.

As DES formulated plans for a CBT library, the Training Section turned to University of Wisconsin-Stout's Office of Continuing Education (OCE) to provide ideas and technical support for the project. UW-Stout has been using on-line computers to deliver in-service training since 1993. OCE's experience with CBT included a history of working with jobs-related service providers on computer-based training delivery projects. Project partners included: Wisconsin's Workforce Development Council, West Central Wisconsin Private Industry Council, Wisconsin's Department of Workforce Development (for both the Division of Economic Support and Division of Vocational Rehabilitation), and the Wisconsin Department of Health and Family Services. OCE had the staff (through its Knowledge Transformation Center) and infrastructure to create, deliver and maintain the library of CBT products envisioned by DES.

Knowledge Transformation Desire Meets Planning Realities

After the Wisconsin legislature allocated W-2 dollars to the Division and planning dollars were allocated to the DES Training Section to pursue CBT alternatives as part of the master training plan, the Section assembled a team to address several planning complexities, including: determining the best delivery method, identifying initial key training issues that should be addressed with the initial allocation of dollars, assigning subject matter experts to work with instructional designers, obtaining support from administrators at all levels as well as end user buy-in, and obtaining cooperation from a diverse set of individuals.

Resistance issues. In any organization with hundreds of individuals serving thousands of people a certain amount of resistance to new training deliveries is inevitable. However, we were unprepared for the re-occurring nature of resistance throughout the development, testing, and initiation process. It became apparent that project personnel must be delivery "ambassadors" in every presentation they provide and in every meeting they attend at every level within the organization.

Hardware/software issues. DES had an existing CBT delivery system in place that included seven regional training centers equipped with 20 station, hard wired computer terminals and on-site staff. The first four months of the project were devoted to seeking installation and maintenance support for a system that would deliver the products created through a major equipment upgrade to the regional centers. Costs, and the desire to reach every individual in their home counties, eventually led to the development of a TCP/IP based delivery system. Additionally, early decisions locked the project into CBT development using Lotus Notes LearningSpace (then in beta development). This decision also led to planning difficulties involving design challenges, system administration challenges, and the need to include other Divisions/Sections within the Department.

Staffing issues. Very few long term projects are blessed with staff who stay with the project for it's entire duration. Turnover in the DES project was especially difficult as it occurred at several levels and in key development positions. Of particular note was the difficulty obtaining/keeping subject matter experts. At the beta testing stage another major staffing issue was encountered: without direct supervisory control over the testers, completion of test components (particularly the provision of critical input) was spotty.

Extra-departmental division/bureau issues. Project control for this project was never centralized within one administrative unit. Instead, several Department of Workforce Development Divisions and Sections were involved, each forced to deal with their own staffing requirements and conflicting time/dollar pressures. First, the primary content creation responsibilities lay within the DES Training Section, but the content specialists at both the authoring and testing levels were assigned from policy units within their content areas. Second, the technical responsibilities for delivery of the CBT products lay with the Division's Bureau of Information Technology Services (BITS). Larger Bureau priorities forced server deployment to take a back seat, lengthening the overall development time frame.

Modification and Design Model

Rapid Prototyping

After many months of false starts, delay, and conflicting direction, staff at the Knowledge Transformation Center adopted a "rapid prototyping" model of development and coupled it with an "every opportunity" marketing approach to smooth out the planning process. In this model, a prototype of the CBT product is created immediately after the initial content is described to the instructional designers (even before content has been provided.) The designers went so far in the creation of the prototype as to "fictionalize" the content to show the future product's "look and feel" as well as navigation elements. This helped to minimize the amount of time content specialists spent working design details (like the shape of buttons) that could be more quickly created by the graphic designers and delivery programmers. This also allowed the programmers to get an early read on the design elements that DES administrators and content specialists desired. It was very apparent that content details were then much easier to identify (by the content specialists) and assisted them in revising textual materials.

Internal DE Concept Torch Bearer

"Every opportunity" marketing of the CBT products is made easier with the existence of several strategically located project staff. This individual usually initiates the project. After the project is initiated, it becomes very important for that individual to build a team of like-minded individuals who, as part of the project team, sell the CBT concept, prototype products, and target implementations at every opportunity. This is especially important as end users seldom "flock" to a CBT product.

Educate on Alternatives

All of the content providers were print and face-to-face training format authors. None had worked on CBT projects, nor had many of them used anything other that text-driven CBT products. A key role for the instructional designers was to provide "what if" alternatives for the delivery. The rapid prototype assisted in this task and became a primary model design tool after an earlier approach led to confusion. One of the first products for which a subject matter expert was identified involved a content specialist who had never worked on a multimedia project. The instructional designers gave a crash course in the breadth and depth of alternatives hoping to stir creative juices. Unfortunately, this led to many weeks of output in the form of button designs, and circuitous flow detailing that could have been more quickly performed by instructional and graphic designers while the content was created. Thereafter, the prototype served as the primary alternative education device.

Platform Flexibility

The project development team was faced with significant shifts in delivery orientation. As project start, the CBT products were developed to be exclusively delivered using a Lotus Notes client loaded on laboratory-based workstations, primarily as CBT support tools for face-to-face instructors. Five months into the project, development was shifted (and early products re-tooled) to develop the courses for delivery remotely to individuals via TCP/IP, primarily as self-instructional tools. Ten months into the project, development was again refocused use the CBT products both as face-to-face support tools for instructors *and* self-instructional tools for supervisors and case managers. A great deal of interest in the use of the products has been expressed by other states without the same infrastructure as Wisconsin. Adopting the products to accommodate their delivery specifications requires that a cross platform protocol (such as TCP/IP) be used in the development process.

"Flexible Control"

Project experiences lead to three primary conclusions regarding the need for flexibility in the planning process. They all rest on the observation that "flexibility" must be tempered with "control" to reduce the effects of bureaucracy on the planning task.

Conclusions

Go to great lengths to consolidate content gathering, system authoring, beta testing, delivery demonstration, and DE product marketing functions within a single line of authority.

- Of primary importance is control of the entire development/delivery sequence to reduce the amount of time wasted dealing with differing inter-departmental priorities.
- If multiple departments must be involved, identify/assign a single contact person with authority over as many entities as possible and communicate, communicate, communicate.

Let the educational goals and audience learning styles drive the choice of your delivery vehicle.

- Avoid the desire to favor familiar/existing delivery platforms.
- Resist organizational pressure to choose existing high overhead systems if other systems will meet your DE delivery goals.

Explode the "Field of Dreams" model and put some real money into the marketing of any DE implementation.

- Start the marketing process by including your audience in the content gathering process that initiates the development sequence.
- Use the "rapid prototyping" model to bring products to the attention of end users (in alpha test roles) very early in the development sequence.
- Actually market your end product using frequent and varied points of contact.

Autobiographical Sketches

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The CLASS Course Design Model for Web-Based Instruction

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Introduction

The CLASS (Communication, Learning, and Assessment in a Student-centered System) Project is creating an accredited high school sequence for delivery on the World Wide Web. Because the Web offers an unique distance learning environment, the CLASS Project has developed an instructional design model specifically for the Web. Coupled with the instructional design model, CLASS has created Web-based instructional design features to maximize the learning opportunities afforded by this electronic education environment. Both the CLASS design features and instructional design model are transferable and scaleable to the needs of other distance education programs.

The Project

The CLASS Project's goal is to make available on the World Wide Web a complete, accredited, high school diploma sequence. The Department of Distance Education of the University of Nebraska-Lincoln (UNL) is recipient of $18 million in federal funding to develop the sequence. When completed in 2001, CLASS will have available to students 54 courses from which to choose to complete these requirements.

The Department of Distance Education is uniquely suited to provide this diploma sequence. Among its units is the Independent Study High School (ISHS). The ISHS is the only university-based, fully accredited, independent study high school in the United States. In operation since 1929 and accredited by both the North Central Association of Colleges and Schools and the Nebraska Department of Education (NDE), the ISHS currently serves about 15,000 students annually in 136 countries. The students can choose among 138 print-based courses in addition to the electronic courses. Enrollment is open, with students registering throughout the year.

The uniqueness and long record of success of the ISHS was recognized by various government funding sources. Beginning in March, 1996, the first funding for the CLASS Project was awarded for proof of concept by the federal General Services Administration. In July, 1996, the ISHS was notified that it had been awarded a Star Schools grant. This was a five year win with first year funding, beginning October 1, 1996. Other funds for the technology invention side of the project came from various components of the United States' service community, including the Central Intelligence Agency and the National Reconnaissance Office.

The Courses

The development of the courses for this project required the recognition of several factors. Paramount among these was the World Wide Web offered a new and different educational delivery method. Therefore, current print-based courses could not simply be transferred to the Web. Second, in order to fully utilize the potential of the Web as an educational delivery system there would need to be new software and technologies developed. Third, and premised on the first two points, production of these courses would take place in a manner different than traditional multimedia production. To put it simply, the project would require invention in both the areas of instructional design and technology.

CLASS is a dynamically interactive, student-centered course environment delivered electronically via the World Wide Web. Students access moving imagery, graphics, sound, and text within a seamless navigational system that encourages individualized learning, discovery and exploration. "Seamless" means that students do not have to open and close applications to move from-for instance-a text screen to simulation (or to a video or discussion group). The technology for supporting all the media of a course is included in CLASS.

CLASS provides new avenues of educational access through cost-effective alternatives to conventional classroom teaching situations. These new avenues are particularly important when reaching out to all levels of students, including nontraditional, geographically isolated or disadvantaged segments of the population, at-risk and the gifted.

CLASS provides individual learners with access to interactive, flexible course materials, including data, graphics and video, and incorporates electronic interaction between learners and instructors. CLASS helps students manage this multitude of materials by providing an electronic "notebook" where students can store and sort everything from video to text. They can share this information with other students or with the teacher.

Courses are formatted especially for electronic delivery. Students are responsible for their own learning, making choices in the paths they take through course units, and selecting from many different learning activities and experiences. Units develop increasing levels of complexity and sophistication within the course content. As students move through the course, their interaction with the materials requires an ever-widening understanding of the concepts being presented.

Students determine their own mastery of the material by taking practice exams that are electronically evaluated, students receive the results in only a few seconds. Examinations and projects are evaluated electronically or by the teacher.

CLASS instructional design provides for interaction between learners and instructors, stressing the development of life and workplace skills, citizenship responsibilities and critical thinking. New technologies provide learners with access to digital libraries from national, historic, scientific and research centers over the global and national information infrastructure.

Instructional Design Model

The CLASS instructional design model was created for efficacious incorporation of input from a wide variety of sources, as well as meeting the evaluation needs of the Star Schools grant. Each course in development follows a similar instructional design sequence. Each course is also unique, requiring varying levels of input from different individuals and groups, depending upon the content, content treatment, timeline, budget, members on the team and their particular expertise. Below is a discussion of the CLASS course instructional design model.

Identify Need

Instructional design for a Web-based distance education course begins with identifying the need. What course will be created, and for whom? Each demographic characteristic of the target student helps define what content should be taught and how it should be taught. From the onset, CLASS tailors instructional design for specific target learner needs, including adult, rural, inner-city, isolated, at-risk, home schooled, home bound, grade level, achievement level and learning profiles. Understanding the target student is critical to many decisions made later during the instructional design process.

Assemble Team

Being able to define the target student empowers decision making when assembling the content development team. CLASS content development teams are supervised by an Instruction Design Specialist (IDS). The IDS is responsible for overseeing all phases of instructional design and assembles a team that includes a(n):

- Teacher who ensures the instructional design meets the needs of the ISHS.
- NDE representative who ensures the instructional design meets state frameworks and national standards.
- Nebraska Center for Instructional Innovation (CII) representative who ensures the instructional design is founded in sound educational psychology.
- Nebraska Educational Telecommunications (NET) Multimedia Project Manager who ensures the instructional design is doable, and then supervises the production of the Web pages.
- UNL faculty representative who provides content area expertise.
- Subject matter expert(s) who writes the content text for the course.

Frequently, other people contribute to the development of content. High school students and teachers, and at-risk education experts provide valuable insight on how to meet the needs of the students targeted for the Star Schools grant. Instructional Designers (ID) help with all facets of the course development process, including editing, storyboarding the course and Alpha review. The content development team is primarily involved in research, conceptual brainstorming, designing a proposal, and writing content.

Research

During the research phase of the CLASS instructional design process, the course development team surveys the state frameworks, national standards, applicable learning theory and existing content sources. The course development team reviews course specific

CD-ROMs, videos, audios, textbooks, other print sources, Web sites and pre-existing ISHS print courses. If the team decides to utilize the assets of an existing content source, the CLASS Contracts Specialist is notified, initiating the permissions process. Equally important as to what content is taught is how the content is taught. The content development team also analyzes and selects applicable learning theory, e.g. for an English course the team might want to consider 6-Trait Writing Process, Whole Language, Great Works, whole texts, descriptive grammar, generative grammar, language acquisitions processes, authentic assessments, and behavioral objectives, as well as the independent learner model and constructivist theory.

Brainstorm

After gathering information, the content development team brainstorms what will be taught-content, and how it will be taught-content treatment. When formulating content, the team considers questions such as:

- How will the student acquire knowledge?
- How will the student demonstrate mastery?
- What outcomes will the student achieve?
- What skills will the student practice?
- What processes will the student be able to transfer from this course to his or her next level of involvement with the subject area?
- What processes will the student be able to transfer from this course to other content areas?
- What life skills will the student acquire from the course?
- What level of independence is expected of a student completing the course?

When designing the content treatment, the team considers the following things:

- What teaching strategies will be used?
- Will the content be delivered via metaphor? If so, what is the most appropriate metaphor?
- What assessment strategies should be used-computer graded, multimedia portfolios, written projects?
- How much teacher time per student should be planned?
- How will the Web-based learning environment affect student learning, e.g. delivery time, tone of metaphor, text and graphics?
- How is Web-based distance education different from and similar to print-based distance education?
- How is Web-based distance education different from and similar to classroom education?

Answers to the above information is collated into a storyboard of what will be taught, how it will be taught and how it will appear in Web pages.

Assign Personnel

After storyboarding the content and its treatment, personnel are assigned to achieve specific tasks. The subject matter expert(s) is chosen to write the course text. The IDS and ID work closely with the subject matter expert(s), designing the Web page look, metaphor, activities and assessments. Other content development team members review the course text and perhaps help revise. NET begins to develop the look and interface for the course. Time and expertise are key variables when selecting personnel roles.

Ascertain Resources

At this time, the Contracts Specialist works on ascertaining resources as identified by the content development team. Working within predetermined use fee limits and budget parameters, the Contracts Specialist determines copyright issues and permissions procedures, and then acquires permissions.

Create Proposal

Before the actual writing of the course, a proposal is created and presented to an external team. The proposal specifies the course to be developed, describes the target student group, lists learning outcomes or objectives and conceptually describes the content treatment, including media options, diversity, special needs, tracking and teacher role. Additionally, the proposal describes resources surveyed and sought for inclusion, describes the units and lists assessments. The course navigation is specified via a flowchart or storyboard. The proposal also identifies specific beta course feature testing issues and the beta evaluation process. Last, the proposal defines support needs, including course development personnel time, expenses and future course maintenance demands.

Create Course

After successful review of the proposal, the content development team focuses their energy on producing all facets of the course. The complete text of the course is written, in addition to descriptions of the navigation, text, multimedia, external links, internal links and communication. Once two units are written, revised and edited, NET begins building the course in Web pages.

Test the Course

Upon completion, the course goes through Alpha test, where all aspects of the course are subjected to a test run by the IDS and ID. Necessary changes are identified and made before Beta testing. During Beta testing, CII oversees the usage of the CLASS course by ISHS teachers, students from the target group and external instructional design experts. After Alpha and Beta testing, the first version of the course is made available for enrollment.

Instructional Design Features

Founded in constructivist learning theory, the CLASS courses utilize interactive designs and student-centered learning activities to facilitate student exploration and discovery. The seamless design enables ongoing self-checks, evaluation and assessment, which empowers students to interact with the courses in sequences or patterns that match his or her learning styles.

In addition to the Web-based instruction, learning in each CLASS course is supplemented by an ISHS or site-based teacher. Embedded within each course toolbar is an e-mail link to the teacher who quickly answers questions. Each course also includes a news group where the teacher may post general announcements or moderate discussion about course related topics.

Student-to-student collaboration is also featured in CLASS courses. Writing students develop their peer critiquing techniques. Other students build multimedia projects together right on the Web.

Each course includes a Web-based "Notebook" where students can take computer-graded objective assessments, write essays and design multimedia portfolios. Students can add graphics to their assignments simply by dragging and dropping them into their notebooks, including audio and video files. The students' notebooks are privilege access secured on a CLASS server, and the students may revisit their assignments before publishing them to their teachers.

CLASS courses are reaching to utilize the Web to its fullest instructional advantage. Content is written specifically for the Web, scaffolded for broader and deeper experiences with the subject matter, and designed so the student has choices of direction and activity. Integral to the CLASS learning environment is wide use of audio and video. Original audio and video files, such as student testimonials about learning strategies in the *Learning FUNdaMENTALs* course and refugees discussing their experiences during the Bosnian conflict in the *Bosnia: Global Perspectives* course, produce an inclusive learning environment. Animated tutorials and interactive self-checks provide modal learning experiences. In *Geometry in Our World,* students interact with a tutorial on how to measure the area of a circle. In *Bosnia: Global Perspectives,* students study geography using drag and drop maps. In fact, each CLASS course illustrates yet another learning method enabled by the dynamic, multimedia capabilities of the Web. And each course is full of World Wide Web links to enhance and reinforce learning.

All new CLASS courses are developed utilizing a toolbar that has a standard look and functionality, easing the student learning curve from one course to another. In addition to using the toolbar, the student has a variety of navigational tools. The student can access course content via layered graphical maps, a course outline or embedded navigational prompts, which include directions that help the student maintain a sense of place.

The opening page or splash screen includes fast links to a variety of important information. A *Netscape for New Users* section helps the inexperienced or reluctant computer user become familiar with the Web learning environment. The *Help* and *Course Guide* sections provide the student with course specific learning strategies and answers to user-related questions. An *Introduction* orients the student toward their expected experiences and outcomes.

The *Grade Report* gives the student and teacher the opportunity to monitor progress. Password secured, the *Grade Report* displays a complete list of course assignments, grades for completed assignments and an accumulated grade.

A commitment to instructional design features using new, relevant technologies as they become available helps make CLASS courses possible for common operating PC or Macintosh systems on standard, multimedia capable, personal computers. And all major resources are cached on a CD-ROM, supplementing the advantages of Web-based delivery by ensuring expedient uploading.

Conclusion

The CLASS instructional design model is a work in progress, regularly revisited and revised. It is used for developing all CLASS courses and easily transfers to a variety of Web-based instructional needs. Whether one is developing a single lesson tutorial or an accredited semester-length course, the CLASS instructional model is sizable to the situation. This instructional design model enables input from a variety of sources, and empowers the designers with feedback before, during and after the process.

CLASS instructional features give distance education students the opportunity to learn using a myriad of learning tools that are unique to Web-based distance education, including student-to-student communication, dynamic learning activities, student-selected learning paths, multimedia-reinforced learning, self-monitoring of progress and the ability to create multimedia portfolios, all in a seamless learning environment not bound by time nor space.

Because of its size and scope, the CLASS Project has the potential to revolutionize the distance delivery of courses to individual students, learning centers and schools that cannot afford or do not have the ability to offer specialized courses such as *English as a Second Language*.

Currently ten courses are open for enrollments with an ten courses available in the fall of 1998. Examples of the courses, along with additional information on CLASS can be found at http://class.unl.edu.

Autobiographical Sketches

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Global Outreach:
Formal and Non-Formal Education

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What Is Global Outreach?

"Global outreach" refers to international delivery of education, health, public information, commercial, and other services using appropriate communications technology. The choice of technology—telephone, computer, satellite, videocassettes, Internet, radio, TV, or a combination of multimedia support, including printed material—depends on the local environment.

Global infrastructure is growing rapidly in information-friendly environments of the developing world. The emergence of a global superhighway is being spurred by the deployment of broadband fiber optic lines and of satellite channel capacity that will soon offer possibilities of universal coverage. Combined with wireless technologies and renewable energy resources, communications and information services are no longer limited to places with phone wires and/or with electricity. This means that children and adults in low-income areas—in remote parts of their countries with limited access to education, health, or other services—now have real possibilities for personal socioeconomic development.

Telemediated Service Delivery of Education

International organizations are partnering in various ways with developing-country governments, private companies, local communities, and non-governmental organizations to seize the vast new possibilities made available by networks of global information infrastructure now being built. Here are six of many programs sponsored by such organizations:

The World Bank. The Bank is fostering development of national strategies and priorities for information infrastructure, as well as encouraging telecommunications policy reforms needed to support an open and growing global marketplace in the new information-based economy. Privatization policies, regulatory arrangements, investment codes, and competition policy will allow telecommunications and information technology products to be traded and transactions undertaken on a cost-effective basis. The Bank sees itself as a long-term partner with its client countries in developing the alliances needed to mobilize financing and support to extend the global information infrastructure and its benefits to people in developing countries.

In addition, the World Bank sponsors the World Links for Development (WorLD) global collaborative learning program. The Program, administered by the Bank's Economic

Development Institute, links students and teachers in secondary schools in developing countries with their counterparts in industrialized countries for collaborative research, teaching, and learning through the Internet. Over a four-year period (1997–2000) the Program aims to link 1,500 secondary schools in 40 developing countries with partner schools in Australia, Canada, Europe, Japan, and the United States. Currently there are 105 WorLD schools on-line in ten countries.

The Leland Initiative. A five-year $15 million U.S. Government program launched in 1996, the Leland Initiative is administered by the USAID Bureau for Africa, Office of Sustainable Development, to extend full Internet connectivity to twenty or more African countries to promote sustainable development. The program is designed to support policy reform to reduce barriers to open connectivity, to work with both host governments and the private sector in facilitating Internet access by providing low-cost, high-speed access to the Internet, and to introduce proven mechanisms to build networks of active users. The countries selected for the program to date are Benin, Botswana, Cote d'Ivoire, Eritrea, Ethiopia, Ghana, Guinea Bissau, Guinea-Conakry, Kenya, Madagascar, Malawi, Mali, Mozambique, Namibia, Rwanda, Senegal, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe.

LearnLink. USAID also funds, through its Human Capacity Development Center, the LearnLink program conducted by the Academy for Educational Development to strengthen learning systems for sustainable development. Its website disseminates various publications and its staff provides consulting support to ministries of education, groups, and individuals trying to apply technology to improving basic education. LearnLink is working with USAID missions in various countries to set up Municipal Learning Centers to expand both formal and non-formal education.

United Nations Development Program. The UNDP funds and administers the U.N. Sustainable Development Network, founded in 1992, to link government bodies, universities, non-governmental organizations, the private sector, and individuals to exchange information on sustainable human development. Hewlett Packard has agreed to assist the Program in its first phase in building an on-line information access and communication network in 16 countries—using HP Internet hardware and software along with other technologies—which supports Internet connectivity to developing countries worldwide. This partnering of public and private sector in expanding Internet access and information technology to developing countries becomes a model for political access and developing-country gain.

Open Society Institute. The Soros Foundation's Open Society Institute provides Internet connectivity in Central and Eastern Europe and the former Soviet Union. Under its Regional Internet Program, the Institute funds pilot projects which provide Internet access, training and support to libraries, schools, medical institutions, NGOs, independent media, and others. Since 1994, the Program has funded over 80 projects in 28 countries, with an annual budget of approximately $10 million.

National Geographic Kids Network. The National Geographic Society has partnered with the Soros Foundation, USAID's NGO program for Russia, foundations of various corporations, and ministries of education to provide localized versions of Kids Network materials and teacher in-service in a number of countries over the past 10 years. Its innovative curricula guide teachers in inquiry-based pedagogy and help them integrate technology use with basic content in science and geography.

Opportunities for Accelerated Growth and Extraordinary Gains

The information revolution offers dramatic opportunities for information and service access to all countries worldwide. However, it is the developing countries that stand to gain most from the revolution in technology because their current infrastructure is inadequate, and the new explosion in technology allows them to leapfrog over yesterday's industrial age and traditional technologies into today's and tomorrow's knowledge- and technology-based economies. There is no need to lay expensive copper wires for phone lines to establish communications, nor to forego communications to outlying areas. The Internet now offers access to information and connections to the world. Other global information infrastructure, such as low-orbiting satellite systems now being deployed, will expand opportunities.

Developing countries also stand to gain from the extensive outreach potential of information technology. The Open University in the U.K., designed originally to provide distance learning largely through correspondence and printed material, now makes use of information technology and serves as a model for new international universities, such as the Indira Gandhi National Open University (IGNOU) in India. The outreach of such universities is virtually unlimited.

To see the potential at the local level, one only need visit the densely populated Mahmelodi Township outside Pretoria, South Africa. There, teacher training is ongoing, making use of the Internet, as well as television broadcasting provided through alliance with a nearby private school.

The potential gains by developing countries are expanded also by the versatility of uses of information infrastructure. It can deliver a full array of public and private telemediated services: formal and non-formal education, health, public information, commerce, public administration. Further, it offers a diversity of tools to the user: writing, communicating, calculating, graphics. It can improve workforce preparation, on-the-job training, and—especially powerful in remote areas—entertainment and opportunities to produce entertainment or edutainment products.

The cost-saving potential of the new technology is a subject of much debate. But clearly it bypasses the cost of building traditional infrastructure, such as the copper wiring of telephone lines referred to earlier. Other examples of cost savings are in book publishing, which can be carried out on a desktop computer by any knowledgeable user. Book distribution can also be facilitated by personal computer. The distribution capability avoids many intermediate steps and intermediaries that in the developing world can be a major impediment. Overhead costs or the operational costs of administration are similarly reduced for telemediated service delivery.

Finally, the localization potential unleashed by information infrastructure can bring extraordinary benefits to developing countries. In the Mahmelodi Township program cited above, the community, once exposed to the possibilities of the Internet and other forms of telemediated service delivery, played a major role in developing a program to bring information technology into the township to train teachers and build basic work skills. The community has formed its own Mahmelodi Township Community Information Service, and realizes its decision-making capability, as well as its own empowerment. The Township program also illustrates implementation of distance learning in different learning environments. In the Township, teacher in-service is carried out individually with personal computers at the community service center; the nearby school's Information Center provides a computer lab and TV broadcasting for groups of teachers and other trainees. The teachers are then responsible for teaching multiple groups of students throughout the Township.

Learning Environments in Developing Countries

Traditional Practice

Formal education, where available in the developing world, has emphasized memorization, lecture and recitation, and an elitist system of examinations for entry into each higher level. Typically, formal education is funded and controlled by a central Ministry of Education that lacks resources to provide equal opportunities for low-income and remote areas. One commonly finds classrooms with poorly trained teachers and few if any materials beyond a blackboard. The emerging technology infrastructure offers opportunities to meet growing demand for equity and to introduce innovative teaching methods that address individual differences in learning styles and motivation.

Radio and television broadcast have been used for decades as the most cost-effective ways to deliver educational content to large numbers of people over a vast territory, especially as non-formal education in the form of public service presentations on health and socioeconomic topics. In many places, people receive such broadcasts in a public place, such as a community center or a bar, because they lack electricity or a radio or TV in their homes and schools. The desire for information of all kinds tends to be even greater than in the developed world because the supply has been so limited. And, even in remote villages, adults are aware of the Information Age revolution and don't want to miss opportunities for themselves and their children. Thus, teachers and other people are more willing to share resources and to accept a level of inconvenience that most Americans would reject.

Emerging Learning Environments in Developing Countries

The various international outreach programs and the Mahmelodi Township Community Information Service example cited above fall into three main approaches, all of them useful in teacher pre-service and in-service education:

- Distance learning courses in content areas
- Workforce preparation and on-the-job training in use of information technologies
- Telecollaborations with distant peers

Content courses. Distance learning courses via radio and TV tend to follow traditional teacher-centered practice, but in combination with Internet connections these courses are now becoming enriched by materials that can be printed locally from computers and by synchronous and/or asynchronous interaction between the teacher and remote learners. Teaming up to share technology resources offers benefits to the more affluent universities and private schools as well as to poor public schools and communities. For example, teachers from poorer schools are invited to come to private schools for training and to obtain downloaded content and teaching materials, and the private schools benefit from financial support and in-kind donations of equipment and Internet access to be shared widely. Highly compressed video will soon make possible acceptably affordable videoconferencing through POTS phone lines, but a centralized TV outreach to masses of learners may remain still cheaper. E-mail is the most likely medium of interaction because of the high cost of phone use, until or unless telecommunication rate reform is more dramatic and widespread.

Technology skills. Technology training is best done in a computer lab where students can have individual access to equipment. Such labs are being set up in municipal centers, universities, and private schools used 7 days a week and as much as 24 hours a day to maximize use of precious facilities. Although such training includes web page design and Internet search techniques, use of the Internet is usually constrained by per-minute access rates. Caching of websites and heavy reliance on e-mail, gopher, and other text-based communication is essential. Without flat-rate access, extended Web browsing by individuals is prohibitively expensive. More emphasis is placed on basic keyboarding, productivity applications, and troubleshooting than on Internet use, which is likely to be limited to skilled users who will share their downloaded information on floppy disks or paper.

Teleprojects. Telecollaborations among distant schools are exciting to teachers and learners in all countries. They offer the prospect of a student-centered learning environment emphasizing inquiry and project-based assessment. However, they are not as easy to launch or sustain as many assume. Although American teachers and students want information and personalized communication with people in exotic places, they often do not understand the constraints (access fees, shortage of equipment, curriculum mandates) of their counterparts in the developing world.

NGS Kids Network has had considerable success in introducing student-centered teaching methods in places such as Namibia, Mexico, and Russia because it is designed for use in such constrained circumstances. Its curriculum is rich in content, process skills, and assessments which give it credibility with ministry and school administrators. Its use of technology, while integral to the curriculum, is designed for flexibility, allowing affluent schools to send as much multimedia information as they wish but also allowing meaningful participation by as many as 200 students with just one computer not necessarily in the school building. The software for Kids Network, called NGS Works, facilitates creation and rapid transmission of various kinds of cross-platform files (text, graphics, database, maps, graphs) by children and their teachers. Automated formation of geographically diverse teams of about 10 classes investigating the same topic during the same 8-week period reduces service overhead cost. Automated compilation of data from thousands of classes allows all participants to share research results from thousands of schools.

Meeting places for like-minded educators are proliferating on the Web, including such programs as the World Bank's WorLD (World Links for Development). For educators who want to develop their own collaborative projects, the following guidelines—based on NGS Kids Network's decade of experience—will help produce a successful international teleproject:

- Allow an academic year for collaborative *preparation* of a project, from identifying a willing partner to agreeing on goals, methods, activities, and timetable.
- Provide motivational entry points for *both* teachers and students.
- Focus on a "driving question" for a period of several weeks or months.

- ❖ Investigate a problem of significance locally and globally for all partners.
- ❖ Plan for tangible results for authentic assessment of students' progress.

Conclusion

The revolution in telemediated education is rapidly reaching into remote corners of the globe, opening real opportunities for bootstrapping socioeconomic development in developing countries and for direct contact between teachers in developed countries and populations they know little about. Global outreach need not be limited to international organizations. American universities, secondary schools, and even elementary schools and after-school organizations can help formal and non-formal education in the developing world. And it's not a one-way street. The models emerging in the developing world for sharing physical plant, computers, Internet access, and master teaching skills may provide some valuable ideas for our own at-risk populations.

References

The following websites offer additional details about programs cited in this paper:

The World Bank's WorLD Links for Development
http://www.worldbank.org/worldlinks/english.htm

The Leland Initiative of the U.S. Government (USAID funded)
http://gaia.usaid.gov/regions/afr/leland/project.htm

The LearnLink program of the Academy for Educational Development (USAID funded)
http:www.aed.org/learnlink/

The United Nations Sustainable Development Network (UNDP funded)
http://www.un.org/esa/sustdev/edu.htm

The Regional Internet Program of the Open Society Initiative (Soros Foundation funded)
http://www.soros.org

The National Geographic Society
http://www.nationalgeographic.com

The following websites provide additional examples of successful international teleprojects:

http://teaparty.terc.edu/
TERC Inc.'s NSF-funded testbed for telecollaborations, including the CLEO project for posting student-initiated investigations

http://teaparty.terc.edu/ll/ho/html/helloindex.html
For a peek at coming Web-based supplement to the introductory National Geographic Kids Network unit *"Hello!"*

http://www.iearn.org/
I*EARN's international community service projects

http://quest.arc.nasa.gov/
NASA's resources and Quest projects

http://globe.hq.nasa.gov/
NASA's GLOBE projects

http://www.learner.org/jnorth/
Journey North project

http://www.gsn.org/project/index.html
The Global Schoolhouse Network

http://landmark-project.com/ggl.html
The Global Grocery List Project

http://www.teleproj.com/
ASTL (Art, Science, & Technology in Learning) Project

Autobiographical Sketches

Mary Oakes Smith is a manager in the World Bank's Africa Region, responsible for developing strategies and applications for telemediated service delivery. She has recently been appointed to the Advisory Board of the United Nations International Partnership Trust Fund, established to work with the United Nations Foundation to advise on the programming of the $1 billion gift from Ted Turner to the UN. In 1997, as a Learning and Leadership Center Fellow of the World Bank, she pursued with academia, industry, and foundations methods and experiences applicable to developing low-income country access to delivery of various services using appropriate communications technology. She managed industry, telecommunications, and energy operations in West Africa from 1990 to 96, and before that was a manager in the finance department responsible for supporting negotiations of the $14–17 billion soft loan fund (IDA) of the World Bank.

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Effective Techniques for Limiting (Faculty-Student) Interaction in Distance Education

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Introduction

Faculty-student interaction is one of the most costly and most troublesome elements of any distance education program. It can account for anywhere from 20–60% of total costs. Unchecked, it can also be a major disincentive to faculty participation in distance education. A successful program will carefully limit interaction. This paper describes and categorizes a number of ways in which this can be accomplished. Some of these techniques are borrowed from the traditional classroom; others are unique to distance education. All of them have been proven effective. In addition to describing these techniques, the paper will also provide quantitative specifications, references and implementation strategies.

Effectively limiting faculty-student interaction requires attention to every phase and aspect of the distance education process. Limiting techniques must be employed in course design, development, conduct and evaluation. They must also be employed in program administration and student support. And they must be applied strategically, with interventions in one area supporting and reinforcing those in another. In a typical course, whether in the classroom or at a distance, about 80% of student questions are related to procedure rather than content. Reducing procedural questions is a matter of careful design and testing. It is also a matter of training students and faculty to handle procedural issues in as systematic way and through other means than a phone call or email. The course interface can also be setup to reinforce efficient procedures.

Categorizing Techniques

The techniques described in this paper can be viewed from a strategic planning standpoint as *strategies* and *tactics* and they can be broken into several categories. Major strategies include:

- Information overload, implemented through readings, Web links, list-serves, broadcast messages and other information dumps.
- Activity overload, implemented through required participation in projects, quizzes, discussion, assignments and other forms of student.
- Time and timing restrictions, implemented through setting and maintaining strict rules for answering questions or providing feedback. These rules apply to time, timing and content.
- Diversion of faculty-student interaction to student-student interaction, through chat rooms, email and discussion groups.

- Course organization and testing, to limit procedural questions and bugs or mistakes in the course presentation or assignments.

These techniques must be implemented and supported at every phase of course conduct, so that they are mutually reinforcing and maintain a trail of deniability in the face of challenge. For instance, a policy of limiting office hours and email response, should be setup in the course announcement. Notifying the class that the instructor is: *world renowned*, a *sought after consultant*, a *frequent lecturer*, a *prolific author*, etc. will caution students against expecting to actually reach the instructor with questions. Likewise the information overload strategy must also be setup in advance, by describing the course as *comprehensive, challenging, far-reaching*, etc.

Examples

The actual details of implementation and the interactions among strategies are important also. The readings overload *tactic* in the information overload *strategy*, is borrowed from the traditional classroom. It is also bound to draw student questions and perhaps objections (especially if the textbook budget passes $150.00). This can be counterproductive, if not planned for. Since the tactic requires around 2,000–3,000 pages of assigned reading, a reasonable thing to do is to break this into *required, recommended and optional*; with, perhaps, 1,000 pages in the required category. Student questions about, "How much do I really have to read," can then be answered through the FAQ section of the discussion tool. The FAQ answer would then read something like this: *A student can achieve a good grade in the course by doing only the required readings; motivated students will, of course, want to go well beyond that minimum.* This FAQ can then be prepared in advance and referred to whenever a question about readings arises. With modern course tools, it can also be integrated into an automated response in an email program.

Readings overload can be implemented in any setting. It is particularly effective in a course that uses the Internet, however, since many pages of reading can be posted for student download. At typical Internet speeds, with typical home printers: access, download and printing can add many hours to the student time budget. Another information overload tactic, which is unique to new technology, is the use of Links in a Web site. It is relatively easy to come up with 100 or more links to any subject and to add these links to your site. Since about 37% of all links are broken, it is a good idea to include extras. This alleviates the burden of testing links before posting them. Links can also be updated and changed frequently to add to the burden. A related tactic, which falls in the activity overload strategy, is to assign Web searches. These are very easy to assign and can occupy many hours of student time. Care must be taken, as in the readings overload tactic, to have FAQ's or diversion tactics ready to answer questions that might arise as students pursue their searches.

The strategy of restricting interaction through timing of office hours and assignments is very effective, but requires careful planning. It also requires firmness and deniability (see "busy professor" suggestion above). One technique that is effective with assignments delivered through the Internet is to set very specific deadlines and then match telephone office-hours to those deadlines. For example, if assignments are due at noon on Wednesday, office hours should be set for 10:00 am to noon on Wednesday. Students will be too busy with last minute preparation to bother calling. Even if they do call, they will accept that the line is busy with other students seeking last minute advice. This technique allows the promotional benefit of telephone office-hours, without requiring any actual conversation.

Perhaps the most effective technique for limiting interaction is course organization. Since about 80% of all students questions are procedural; careful course design and testing will eliminate most of them. The downside to this strategy, however, is that the students will have more time for content related questions, which may be more difficult to answer. One way to cope with this is to hire a smart Teaching Assistant. Another is to use the "diversion" tactic and shuffle content questions off to student-student interaction. To maintain deniability, as mentioned in previous examples, this tactic should be setup in the beginning. This is best done by incorporating phrases such as *student-centered course design* and *featuring network-enhanced interactivity,* into the course promotional material.

Conclusion

The above examples show a few of the more than 40 different techniques described in the complete paper. These techniques are organized into categories for easy reference, with appropriate supporting tactics described for each aspect of distance education. A handy checklist is also provided, covering all phases of organization, development and delivery. The paper can be presented in an information session, or in a workshop, with (limited) participant interaction.

Autobiographical Sketch

Tom Smith is Director of Telecommunications Programming for the Department of Engineering Professional Development, University of Wisconsin-Madison. He joined the department as a Faculty Associate in 1977 and currently directs a series of short courses in telecommunications technology and applications. He was instrumental in the planning and development of the University's capabilities for distance education course delivery through audiographic teleconferencing and satellite communications. In 1992, he received the Extension Award for Excellence in recognition of this work. He is currently working to develop Web-based course delivery in the College of Engineering. In early 1998, he received an award from the American Society for Engineering Education for his conference workshop on Web-based instruction. Mr. Smith holds an AB degree from Dartmouth College and an MS from the University of Wisconsin-Madison. He has written a number of papers and articles on telecommunications and distance education and is a frequent speaker on this topic.

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The Trials and Tribulations of Large Scale Pilot Programs in Distributed Education: Final Research Results From the UW/Lotus Experience

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Note: The following is an excerpt from research conducted within the University of Wisconsin System. A complete copy of the research report is available. For further information, call the University of Wisconsin Learning Innovations at 1-888-414-2534. **This is a working draft in progress.**

Executive Summary

A rich history of innovative leadership exists at the University of Wisconsin, which has utilized technology to advance education for decades. For over a hundred years, the university has provided correspondence courses and pioneered the use of public radio and television, and audio, video, and computer technologies for education. Currently, audiographics, live interactive satellite capability, fiber optic networks, compressed video, interactive computer networking, and virtual reality are being utilized to provide the most appropriate and effective learning possible. This history is combined with a powerful commitment to the application of telecommunication and computer technologies to enhance learning, a commitment that is part of the Offices of the Governor and the University of Wisconsin Board of Regents' university-wide support of research and development.

The Partnership

The partnership between the University of Wisconsin System and Lotus Development Corporation (herein referred to as Lotus) was viewed as an opportunity to research the impact of the asynchronous learning software LearningSpace™ on teachers and learners. LearningSpace™ was viewed at the inception of the study as the instructional tool that provided the most flexible and comprehensive student-centered asynchronous approach for both on- and off-campus learning.

The UW/Lotus Pilot Project (herein referred to as pilot project) was conducted throughout the UW System, a system of 15 institutions and 26 campuses. The pilot project was the largest beta test site for LearningSpace™. In October 1997, the UW System established UW Learning Innovations in order to advance emerging educational technologies such as LearningSpace™ for the benefit of the UW System and external clients. Among the many conversations that took place during the partnership between the UW System and Lotus, the most intriguing focused on the nature of the partnership, strategic alignments between the university and the private sector, and the potential subsequent benefits to both organizations' objectives and mission.

Initially during the pilot project, the potential costs for instructional technology solutions were a concern. Despite initial apprehension, however, positive cultural and operational transformations occurred on Wisconsin campuses because of the dynamic partnership between the UW System and Lotus. It is believed that this transformation will ultimately provide more opportunity, access, and flexibility for students both within and external to UW campuses.

The Report

The research sought to answer two questions: (1) Historically, what happened within the UW System with the pilot project of LearningSpace™? and (2) Was LearningSpace™ an effective tool for instruction? The research specifically examined the time period from August 1996 to December 1997. A constructivist approach utilizing a constant comparative method was used to direct the research, with the primary aim of identifying policy implications regarding the effectiveness of LearningSpace™ in a higher educational context.

The report is a snapshot of the events, ideas, and perspectives presented on the use of LearningSpace™ as it exists within the UW System. Statistics measuring the effectiveness of LearningSpace™ were not obtained because the research was specifically designed to be qualitative in nature. The choice for a qualitative approach seemed appropriate in light of the fact that the software was in beta stage.

The Results

During the fall of 1997, 35 faculty members offered 44 for-credit courses using LearningSpace™ at eight campuses across the UW System. The faculty came from business, hospitality and tourism, education, and communication. Interviews with instructors offered insight into the effectiveness of LearningSpace™ and helped to identify factors necessary for success when using LearningSpace™. The qualitative interviews revealed the critical importance of:

- an understanding of the potential for altering and impacting the teaching/learning environment in higher education within political, structural, and financial contexts;
- the employment of a comprehensive curricular design/pedagogical approach developed specifically for distributed learning;
- short/long-term planning considerations on all levels;
- availability and reliability of quality technical support and expertise; and
- a comprehensive campus network and infrastructure.

In addition to the attributes listed above, the research demonstrated that students experiencing the new environment increasingly sought increased options and demanded availability to technology-enabled education. There was a distinct shift in emphasis from instructor-centered delivery to learner-centered competency. The research demonstrated that it is critical to establish a comprehensive and stable technology infrastructure in the campus computing architecture and adequate and stable software configurations. Also, there is a need for continuous, dynamic training and planning for new versions of hardware, software, and systems configurations for faculty, students, and support staff.

The results of the interviews and surveys suggest that LearningSpace™ is an effective tool for providing an instructional environment within higher education, one whose quality is at least as high as that of traditional face-to-face instruction. Due to enhanced curricular design, adaptability to various learning styles, and enhanced levels of student support, asynchronous instruction has the potential to be of higher quality than traditional face-to-face learning. This finding is reinforced by the fact that faculty members noticed a cognitive shift from rote learning to increased problem solving, and by the fact that students are demanding more availability of asynchronous learning as a way to control their own learning.

Significant barriers exist to understanding this emerging environment. For example, the instruments, the process, and the indicators for measuring the effectiveness of asynchronous teaching and learning have not yet been developed, so educators and policymakers often use traditional indicators to measure nontraditional and unusual methods of teaching and learning. In addition, the cost of instructional technology can be high. The UW System's Chief Information Officers echoed this when they expressed concerns regarding the cost of initial and ongoing support for technologies such as LearningSpace™. These conclusions suggest the need for an in-depth cost/benefit analysis. The research also suggests the need for a paradigm shift when addressing issues of class size, student services, development, and testing/assessment in operations involving asynchronous educational technologies.

Autobiographical Sketches

Marin E. Tengler is the Senior Program Manager for Learning Innovations, a center created for the UW faculty and learners to create, distribute and evaluate digital technologies. She is completing her Ph.D. in Educational Administration, with specific focus on distributive technology at the University of Wisconsin-Madison. She worked extensively on the evaluation with the UW/Lotus LearningSpace Pilot Project. Her research areas specific interest are, continuing education, evaluation and assessment, access and, student motivation in a digital environment.

Jeffrey S. Sledge is the Director of Business and Venture Development for UW Learning Innovations. He drafted the strategic plan for the creation of Learning Innovations and was the program manger for the UW/Lotus Pilot Project. In that role, he identified the opportunity to form a joint partnership developing the working and legal structures for that unique partnership. Prior to his work at UW, Mr. Sledge has 18 years of experience in founding and developing companies that provided mission critical computing systems to the engineering and financial services industries. Mr. Sledge has a Bachelors of Science in Geography (Cartography) from the University of Wisconsin-Madison.

Evaluating for Distance Learning: Feedback From Students and Faculty

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Distance learning methodologies support a wide variety of academic programs for residential and off-campus students. These delivery technologies, including audio and video teleconferencing, computer conferencing, and web-based instruction are changing the way students interact with subject matter and faculty. In addition to enhancing traditional learning practices, distance learning technologies affect how students engage the global community through on-line resources. Internet site design and user compatibility provide a starting point to integrate computers into instruction.

Web-based instruction, for example, is growing faster that any other instructional technology (Crossman, 1997). With a computer connection, students and faculty use the web to exchange information and access resources from around the world. The popularity of web-based instruction is attributed to its convenience and flexibility of access (Daugherty and Funke, 1998).

The innovative nature of distance education methodologies demands close examination regarding the issues and practices relevant to educational quality and integrity. Reeves and Reeves (1997) concluded that there are many issues relevant to the web that have to be fully investigated for their pedagogical soundness. Web resources are viewed as a means by which to keep courses current, however, accuracy and timeliness plague sites that are not regularly updated.

While some faculty embrace the challenge to incorporate new technologies into the learning environment, others are overwhelmed by them (Collis, 1993). Dillon and Walsh (1992) found that faculty involved in distance education acquire more positive attitudes as their experience with distance education increase. Herther (1997) suggests that the quality of learning through distance education be evaluated before web-based instruction is subsumed and adopted into university practices.

Evaluation is an integral part of course delivery and development. Cost-benefit, learner satisfaction, goal attainment, and accountability require faculty to gather and submit feedback on the effectiveness of course process and content. Evaluation studies provide timely feedback and constructive criticism to the developers and designers using information technology while the curriculum is still evolving (Collis, 1993). Positive evaluations encourage administrative support of policies, practices, and infrastructure relevant to distance education. Furthermore, insights gained broaden faculty understanding of the commitments necessary to develop quality programs that enhance the traditional learning environment.

Collis (1993) suggests that distance education projects are marginally evaluated. Furthermore, when they are evaluated, the evaluations focus on either client satisfaction or factors correlated with learner persistence or attrition. This paper focuses on participants' feedback about the content and relevance of web-based instruction. Students and faculty were queried about product and process. The importance of faculty and learner feedback in furthering the distance education mission is stressed. Formative evaluations were used to provide information about improving the course. Summative evaluation were carried out to make judgments about the basic worth of incorporating web-based technology into the freshmen seminar.

Integrating Distance Education Technologies

Beginning fall 1999, the Pennsylvania State University will require all entering students to take a freshmen seminar. The purpose of the seminars is to support the transition of students to the University environment. Penn State's College of Agricultural Sciences offers *Be a Master Student!* (AG 150) as a two-credit course to entering freshmen. The course focuses on 1) facilitating the student's transition to the university community, and 2) increasing each student's understanding of the issues and opportunities in the agricultural sciences.

To address an identified need, a web-based component was added to the AG 150 curriculum in fall 1997. The intent was to use communications technology to enhance the agricultural sciences component of the curriculum, making the course available to Penn State students and non-students throughout the Commonwealth. The goal was 1) to develop web-based resources that would facilitate the exploration of current issues in the agricultural sciences and their associated resources at Penn State, and 2) to develop a series of activities or lesson plans for students and faculty teaching AG 150 to integrate into the curriculum.

Before this project, computer-based instruction was not available to faculty teaching AG 150. The website supplements the classroom experience by providing a solid core of common resources across sections and campuses as well as the opportunity for students and instructors to interact electronically outside of class. In addition, faculty could draw course assignments from a plethora of web-based resources.

Project Development

Technology-based instruction requires much planning and collaboration. Integration of technology resources for AG 150 was a complex task. It required the synergy and patience of faculty, support staff, and students. The website developed to supplement instruction in the College's freshmen seminar was not created by faculty currently teaching the course. Two faculty members from the College of Agricultural Sciences team taught each of the nine sections. Faculty, often independent and accustomed to teaching autonomously, were required to work in teams to collaboratively develop course materials. Thus, it was imperative that tools and other opportunities be developed to demonstrate to the teaching faculty how the site could support their instructional objectives.

Web-based instruction is a relatively new methodology in higher education, and many issues still need to be addressed. Lack of faculty incentives, limited access to technology, and insignificant support can hinder successful delivery (Bowen and Thomson, 1994). Lessons learned through formative and summative evaluations of the instructional technology portion of the AG 150 seminar provide a road map for faculty pursuing web-based instruction.

Because the University has made the freshmen seminar a requirement, AG 150 has become a model for other colleges to follow. This prototype includes among other things—World Wide Web-based instruction with virtual tours, career path designs, faculty interviews, and links to many relevant resources on the Internet. The site http://www.cas.psu.edu/docs/CASOVER/AG150.index.htm is relevant to anyone interested in agricultural issues.

Evaluation Process

To test the goals for the project and to learn even more about this new learning approach, it was agreed from the outset to collect as much data as reasonable. The population for the study was all of the students in AG 150 *Be a Master Student!* during fall semester, 1997. Because the number of students in AG 150 was small ($N = 170$), a census was used. Students were given a pre-test at the beginning of the semester to assess their access to, knowledge of, and proficiency with computers. The pre-test instrument used was designed to address four broad categories: 1) computer use, ability, and perceptions; 2) Internet perceptions and use; 3) communication preferences; and 4) demographic information. The formative evaluation assessed student needs and helped the project team continue to develop course content for the semester.

During the semester, faculty used the web-site to supplement in-class lectures and provide resources for assignments. Three of the nine sections specifically used the AG 150 web site. One instructor maximized the AG 150 site by using it in another course. Instructors indicated that helping students determine how to evaluate the credibility of web-based resources now needed to be incorporated into their instruction.

A summative evaluation was given at the end of the semester to ascertain students' perceptions of web-based assignments and needed changes for future courses. Students were queried on using the Web for AG 150 and other courses. Among the 170 students registered, 142 usable, completed post-test questionnaires were collected, an 84% response rate. One of the faculty members from each section participated in a phone survey, answering questions about their experiences with the course.

Findings

The formative evaluation queried students about course content, expectations, and use of the World Wide Web. The survey findings indicated that generally, freshmen access to and knowledge of computers is increasingly. Of the 142 students who were surveyed during fall 1996, 57% owned computers. Among those who owned their computers, 46% ($n = 66$) indicated that their computers were connected to the Internet. Among the two-thirds ($n = 108$) who owned their computers in fall 1997, 72% indicated that their computers were connected to the Internet. Also fall 1997, three-quarters of the students (74.6%) responded that they were already using computers at least once a day. Almost half of the students (45%) stated that they used the Web for class assignments. Forty-four percent indicated that a course that required a web-based supplement appealed to them. The students also indicated interest in learning about job opportunities, internships, and University resources.

In response to student surveys, faculty integrated additional content on career opportunities into the course before the semester's end.

The summative evaluation addressed learner satisfaction with the technology. When asked what they liked most about using the Web, two-thirds (*n* = 93) of the students expressed that they liked its convenience and wealth of information. Typical reasons students gave for using the Web:

- "It's easy to get a lot of information without leaving home. "
- "It's a hands-on approach to learning."
- "I think it is important to be able to use the Web, because it is such a prevalent means of communication."

In addition, students expressed a concern regarding the reliability of web-based information. When prompted about the accuracy of web-based information, 57% of the 142 students indicated that they considered the source to determine if information is credible.

This freshmen seminar is one of many projects to integrate distance education technologies into University curricula. In every section, students were expected to submit at least some, if not all, assignments via e-mail. The results indicated that students who do not own personal computers must be considered when designing technology-based instruction. Instructors consistently commented on the increasing computer literacy among students during the past two years. Specifically noted was that students with the fewest computer skills were non-University Park (main) campus based. Faculty involved in recruitment for the College in addition to the freshmen seminar recognized the Web's potential as a recruitment tool among secondary students as well as among those in higher education who are outside the agricultural sciences. For the site to be used in this way, faculty noted that placement on the College's homepage becomes crucial.

Conclusion

The project revealed that using a computer-based, asynchronous teaching model is quite different from the more traditional model and requires special considerations. Although entering freshmen are expected to be increasingly computer literate, students enter the university with varying levels of expertise. To optimize the students' educational experiences, faculty will need to be aware of the competencies students bring in order to maximize their learning opportunities.

Furthermore, it is important to note that access to technology is not a significant incentive for faculty to embrace new teaching methodologies. Relevance to subject matter, timeliness of information, and facilitation of instructional objectives are required for successful integration of web-based resources.

While many students enter the university with Internet experience, some faculty are still learning how to incorporate instructional technologies into learning opportunities. Faculty need administrative support and opportunities to develop effective technology-based courses. Faculty must openly communicate with students and each other throughout the learning experience to develop curricula that effectively use distance education technologies. Web-based information is easily accessible and convenient, however, its reliability and accuracy can be questionable. Faculty that incorporate web-based instruction into the curriculum should develop ways for students to test the accuracy of information found on the web.

The evaluation process is key in the communications process. Identifying relevant issues and problems during the course provides opportunities to develop solutions for quality educational programs. Student feedback during the learning process helps to shape the course and improve the learning experience. Practitioners that seek to integrate distance education methodologies into existing curriculum should incorporate formative and summative evaluations to enhance learner satisfaction, to ensure goal attainment, and to demonstrate accountability.

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Autobiographical Sketches

Joan S. Thomson, associate professor, Department of Agricultural and Extension Education, at The Pennsylvania State University, is the process in-charge of the undergraduate minor in agricultural communications in the College of Agricultural Sciences. The research reported was supported through the Innovations in Distance Education grant funded by the AT&T Foundation to Penn State Continuing and Distance Education. This grant is supporting the development of guiding principles and practices for the design and development of effective distance education of which this project is one initiative. Additional support was provided by the Penn State Center for Academic Computing.

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Integration of Live Video and WWW Delivery Systems to Teach University Level Science, Technology, and Society in High Schools

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Purpose

We provided Science and Technology in Society, a university general studies course, to advanced placement high school students using a combination of live video presentations and World Wide Web courseware. This gave regional high school students an opportunity to earn three credits toward a required course at the University of Wisconsin-Whitewater (UWW), in one semester of high school without traveling to the university campus. The university, in turn, saw this as an opportunity to recruit high performance students and to possibly slightly reduce student enrollment pressure in the often over-subscribed classrooms used for the Science and Technology in Society course in the following fall semester.

Course Description

Science and Technology in Society (STS) at UWW is a science literacy course rather than a course introducing extensive science content. Required topics covered in STS include science history; art, science, religion and philosophy as world views; pseudoscience; the philosophy of science; ethics of science and technology; science and the media; types of scientific inquiry; experimental design; data analysis; science communication; risk/benefit analysis; and interactions between science, technological development, and the society at large. A typical class is composed of about two thirds freshmen and one third sophomores. Up to 58 students meet twice per week for lecture, then break into groups of up to 29 for one additional discussion session per week. Students must have credit, or be concurrently enrolled, in intermediate algebra. Enrollment in or completion of STS is required before students may take any non-major's science course. There is a similar co-requisite for most major's' science courses, as well. The careful integration of STS shows that the university considers the course content important as a foundation of its science education programs.

Approach

Instructors

The class was taught in tandem by a chemistry instructor who also has extensive training and expertise in personal computer programs and networking (JB) and a biologist (LU). Both had helped develop the traditional version of the course, and have taught the course for at least two and one half years before this trial began.

Facilities

The distance education version of the course was taught in the fall semester of 1997. Three local high schools participated, using the Jefferson-Eastern Dane Interactive (JEDI) Network. The JEDI Network uses fiber optics to connect nine southeast Wisconsin school districts and three campuses of the Madison Area Technical College in a live audio/video network. Each site can simultaneously transmit two camera video signals and display up to four incoming video feeds. One camera in each facility is mounted at the back of the room for following the instructor, and another is mounted in the back to send images of the students to the other participating sites, allowing students to interact with each other as well as the instructor. Local and distant cameras can be zoomed and panned with a television-type hand-held remote control. One of the video lines may be redirected to a document camera as necessary. There is a student microphone for every two to four seats, depending on the facility, and a wireless clip-on microphone for use by the instructor or discussion leader. Each JEDI facility also has a facsimile machine and telephone.

The Course

High school student enrollment. The course was advertised to high school students through established publicity mechanisms of the JEDI Network. Registration was restricted to juniors in the top 25% of their class, and to the top 50% of the senior class. Sixteen students enrolled at Whitewater High School, where the lectures originated. Six more registered from Lake Mills High School, twenty miles away. Four students from Johnson Creek High School, 20 miles from Whitewater, but had to drive five miles to Lake Mills twice a week to participate due to a room scheduling conflict at their home institution.

High school data collection and assignments. The instructors met the students from each school personally at the beginning of the semester to introduce themselves and the course goals and objectives. The instructors used the opportunity to distribute a learning style inventory, and a survey covering demographics, reading and television preferences, computer experience, and academic course work and interests. We also gave them a 50 question multiple choice pre-test over course content, encouraging serious effort by offering them one point extra credit on their first exam for each ten questions they answer correctly on the pre-test. The final examination was identical to the pre-test and served as a post-treatment test. It was also given to the students in person. All other course assignments were given, submitted, critiqued, and graded over the World Wide Web, using TopClass version 1.20 (later upgraded to 1.22a), and integrated course presentation package from WBT Systems. It includes an internal E-mail system, announcement and class discussion bulletin board threaded one layer deep, a course lesson area, testing options, and private score reporting functions for each student.

University sections using the WWW. Two sections of the course for university students were taught by the same instructors, using the same organizing overhead transparencies, and using the same survey, testing, and assignment protocols as for the high school students, but in a standard classroom without video equipment. Although discussion sections were scheduled as usual, there was little direct interaction of the students and the faculty during the discussion periods. Instead, it was used simply as a time when the students were assured fifty minutes of uninterrupted access to campus computers. They could, and often did, elect not to attend and to work on their assignments at their own convenience. Although a note was included in the student timetable flagging these sections as, "experimental course. Requires knowledge of e-mail and World Wide Web for independent work in discussion period," we believe there was little self selection among the students for this section. The high student demand because the course is mandatory and the limited class size creates sufficient enrollment pressure that students likely registered for the section as room and schedules allowed, rather than in response to the timetable notice.

University student control sections. Another three sections were taught identically to the university sections just described, except the discussion sections were conducted as usual. There was extensive interaction between the instructors and the students, and student group work was highly encouraged. Assignments were identical to those in the experimental sections, but were distributed and collected on paper.

Results

Grade Performance

The average grade point averages for each class are shown in Table 1.

Table 1: Class GPA for Traditional and Distance Education Sections

University students, traditional delivery	2.39
University students, WWW exercises	2.13
High school students, WWW exercises/on-site lectures	2.69
High school students, WWW exercises/video lectures	2.20

There appears to be a minor decline in performance among UWW students using WWW for class exercises, as compared to those attending scheduled discussion sections. This may be due to the medium of delivery itself, or because the traditional class room had personal instructor contact and clearer opportunities to work in groups, since they were required to attend discussion sections to receive their assignments. It may also be due to an increased lag time in instructor feed back for the sections using the WWW, since we found there was a very large increase in grading time required in electronic grading to call up documents, type comments, and to compare papers to assure consistency of grading.

There also is an apparent decline in performance between the JEDI (high school) students on-site and off-site. Although small sample size makes its reality questionable, it appeared to the instructors that the off-site students did not focus as well on lecture material during class, without the physical presence of the instructor in the room. Because of the relatively large group of off-site students for the given facilities, at times it was difficult for the instructors to adequately monitor the attention and response of those pupils.

There was not a noticeable difference in performance between the high school students and the more traditional college students. If anything, the JEDI students performed better than their older colleagues. UWW requires successful applicants for admission be in the upper 50% of their class in high school, mirroring the registration criterion we used for seniors in our course. It is unlikely, then, that academic ability of the students differed except by sampling error, although it is possible that there was additional self-selection among the high school students due to the advanced placement status of this course.

Critique of Course Delivery

Successes. Anecdotally, the instructors were pleased with the delivery of the course overall. If possible, they will continue to follow the JEDI student cohort for admission to UWW, as compared to a randomly selected group of students from these schools. The advance college credit may serve to increase the likelihood that these students will attend UWW, and hence may prove a useful recruiting tool to help keep our best students in Wisconsin, as well as a chance to challenge and stimulate these students while enriching their curriculum.

Limitations. The instructors chose to use complex essay, take home questions for a required examination and an optional second final (in addition to a required multiple choice final) in order to limit the impact of student collusion on exams. In comparison to the mix of essay questions with objective questions that they have used in previous semesters, this substantially increases workload and contributes to the inability to quickly provide performance feed back to the students. For this strategy to be implemented routinely in the future, they feel that class size or course load would have to be reduced to improve teacher incentive and grading turnaround time. Alternatively, additional assistance may be recruited from distant sites to allow monitored in-class exams, as is typical for non-distance education classes.

Concerns. The integrity of the study was damaged somewhat due to the inadequacy of the particular WWW distribution vehicle in use. The version of TopClass installed at the start of this course had flaws which manifested in a major systems failure in the third week of class. The technical support provided by the company was inadequate, requiring three full weeks to provide a program patch and to debug the now corrupted database. Although the problems were mostly solved at the end of that period, occasional problems in receiving submitted material continued through the semester, and increased in frequency with time. It was very difficult for instructors to confirm that missing assignments were indeed due to server problems, rather than oversight by the student, meaning that a number of missing assignments had to be excused, without confirmation of student hardship, as would normally be required. In addition, student frustration in completing and submitting their assignments undoubtedly compromised the learning environment and student attitudes toward this approach.

Student attitudes and expectations. In spite of this problem, student comments from the JEDI class proved mostly positive. Two surveys were conducted by Mr. Roger Yin, with short answer questions given the first and the last week of the semester to the students who agreed to participate the research study. The survey questions were designed to assess both students attitudes and technological skill levels. In general, students' initial expectations of the distance learning class were consistently matched with what they think they have learned after the class, except the intermittent TopClass server crashes that interrupted their discussions or forced them to resubmit their assignments. Regarding computer skills, all participants think the use of World Wide Web as a gateway to communicate with both instructors and peers actually leveraged their ability to apply computer knowledge toward meaningful problem solving and information sharing.

Projections for the future. The infrastructure now in place has the potential to serve as a framework for additional course offerings that incorporate interactive WWW lessons for self directed studies. This could mean courses delivered entirely over the WWW, or for use in tandem with traditional deliveries. For instance, to address the problem of additional faculty burden per student, practice questions could be posted with feed back from the instructor programmed in advance. The instructor response would be customized depending on the correct or incorrect answers submitted by the student. Open class discussion on-line will be enhanced in future versions of TopClass, allowing fully threaded discussion. TopClass or other similar courseware packages may also be used in conjunction with other Internet tools, such as E-mail, Internet Relay Chat (IRC) and bulletin board systems, or WWW simulations thereof, such as HyperNews, previously used with good results by these instructors.

Conclusion

In summary, the combined audio/visual and WWW delivery of course content to high school students for college credit appeared to be an effective teaching strategy, in spite of some barriers due to bugs in the selected WWW course delivery system. Although the approach adopted here for distance learning is more time intensive per student for the faculty as compared to traditional classroom instruction, it can be useful when distant education is a valued part of a university's mission. The technology and infrastructure established by this project is continuing to be used to explore novel delivery systems for course material, seeking to improve student performance in both traditional and nontraditional settings.

Acknowledgements

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Lessons Civilians Can Learn From Air Force Distance Learning Programs: The Good, the Bad, and the Ugly

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Overview

The purpose of this session is to share "lessons learned" from Air Force distance learning programs with the civilian community. Following the admonition of last year's conference to connect and collaborate, this presentation is an attempt to bridge the gap between the military-the Air Force-and the civilian sector. I'll begin by providing a brief description of how the Air Force uses distance learning and then share the factors we believe made effective programs successful. I'll then describe what the key factors are that separate effective from less effective distance learning programs.

Background

Distance learning has been a normal part of Air Force education and training almost since its creation as a separate service. In 1950, the Air Force established a correspondence school, which would grow to become the largest correspondence institution in the world. In 1975, this school became the first governmental institution to be granted accreditation by the Distance Education and Training Council. Today, it offers more than 400 courses ranging from career development to military education to specialized instruction. While these are predominantly paper-based courses, the Air Force has had a lot of experience with issues common to all distance learning programs such as curriculum development, testing, instructor training, production and distribution.

Besides its 400 correspondence courses, the Air Force has more than 300 courses offered at a distance. These range from technical training for aircraft mechanics to continuing education for lawyers to acquisition courses for program managers. More than 35,000 Air Force personnel are currently enrolled in these 300+ courses. Learning technologies in use include CD-ROM, floppy disks, interactive satellite broadcasts, the Internet and even interactive laser disks.

Discussion

Let's now examine characteristics of distance learning courses that were successful and unsuccessful. Since the intent here is to focus on the reason why they were successful or not, I'll omit details such as titles, authors, and the like.

Most of the courses successfully offered at a distance within the Air Force today began with a curriculum analysis and media selection process. Conversely, most of the distance learning courses that have failed, or were not as effective, did not have a feasibility study. Prior to converting any courseware, it is imperative you conduct a thorough analysis to determine if distance learning will meet the learning objectives of each course, and if it will be cost effective to do so. I cannot overstate the importance of conducting such an analysis. A good source for elements of a feasibility study is ASTD's Info-Line series booklet titled, "Effective Distance Learning."

A feasibility study will examine course content first and then look at delivery methods. The curriculum analysis-the first part of the feasibility study-will ask basic questions about a course such as the number and type of students attending. It will also ask you to provide detailed information about course objectives and the methodologies used to meet them. This information is critical when determining whether a course can be converted to distance learning. When examining media, a good media selection tool will ask you if your students and instructors have access to and the ability to use the given medium. It should also ask about infrastructure such as existing equipment and technical support. You must then decide how important these characteristics are for each course. Through a simple weighing process, you will quickly see which media are the most likely candidates for exporting your course.

Instructors who are both comfortable and conversant with the changes distance learning requires of them account for the success of our courses broadcast over satellite. Teaching in front of a camera is significantly different than teaching in front of a class. Instructors who assume that just because they have 20 years teaching experience that they won't need any training on how to teach over satellite, are about to embarrass themselves and disappoint or disgust their students. Thus, it is vitally important to have some type of indoctrination program for instructors so they are equipped to succeed. A good training program will include "hands-on" sessions where instructors can actually conduct several dry runs. They need the opportunity to adjust to being in a studio with bright lights and cameras. They also need an opportunity to get used to talking to a camera, a support staff and students simultaneously. They should have incorporated some type of interaction strategy to occur every 7–10 minutes in the lesson plan. We have a 5-day course for our education instructors and a 10-day course for our technical trainers, both offering several "hands-on" sessions. It is quite obvious to the learners which instructors have taken advantage of these orientation courses and which have not. Having discussed two factors that were key to the more successful distance learning programs, let's now examine factors that were overlooked and consequently reduced the effectiveness of the migration to distance learning.

Calculating the cost of a distance learning initiative is both extremely critical and yet, difficult to do. While it seems inherently obvious that you would want to know the estimated cost before approving a plan to use distance learning, calculating the cost is not always done, mainly for two reasons. First, there aren't a lot of good cost models in existence for distance learning. Second, there is a tendency to become enamored with some new technology, or an existing technology rewrapped in a pretty box, complete with bells and whistles. Seduced by the sirens of "quicker, faster, cheaper" the decision-maker may lock onto an approach that results in a product that's not the most cost-effective. Dr. Steve Duncan of the Army Training Support Center describes this phenomenon this way: failure to resist the toy store mentality. Starting with a good curriculum analysis and media selection may mitigate this error.

Another factor that can make or break the success of a program is buy-in from the key players within an organization. Karen Mantyla and Rick Gividen offer some practical advice on obtaining leadership commitment in their "Step-by-Step Guide for Trainers." But besides getting a commitment from leadership, you also need to get buy-in from all the offices that will support your project. Thus, when developing your proposal, your best bet is to invite and involve all the players to your first meeting and then all subsequent meetings. Seeking and using their advice is the key to getting their commitment to your initiative. Otherwise, you may develop and deploy at considerable cost a system that is not used at all locations because one office doesn't think you can train this new way.

I'll conclude this discussion with a plea for some type of master plan. Call it a strategic plan, a roadmap, a vision for tomorrow, or whatever you want, but if you want your journey down the distance learning road to be a success, you must have some type of document that describes where you are today and where you want to be tomorrow. It should define your view of distance learning and explain to the reader how migrating to distance learning will address the deficiencies that exist in the current system. And it should be written from a systems view.

Michael Moore and Greg Kearsley's state in their book, Distance Education: A Systems View, "A common misperception among educators who are not familiar with a systems approach is that it is possible to benefit from introducing technology in education without doing anything to change the other ways in which education is currently organized." They continue, "It is not possible to improve quality, provide for more students, and lower costs without reorganizing education according to a systems model." Why? Because . . . "a distance education system only becomes cost-effective when it takes advantage of economies of scale." Thus, we need to adopt a strategy that views distance learning as a 'system' rather than an independent initiative. A quick review of most organizations' experience with distance learning reveals there were no master distance learning plans outlining a systems approach before they developed and then fielded the various solutions they now have. Rather, their history is a history of initiatives individually hatched, often in conflict with other programs, and often without a full analysis sometimes resulting in what some have termed 'hobby shop' operations.

What, then, is the solution to meet distance learning requirements? Adopt a strategy that outlines an integrated approach to using distance learning with a clear end-goal, an end-goal that is both realistic and achievable. As Moore and Kearsley note, "Following a systems strategy, each component may be developed and operated in such a way that it is fully integrated with the development and operation of all other components, making them each supportive of the others." Organizations must write planning documents with a systems view in mind to ensure each initiative complements, not conflicts, previous efforts.

Conclusion

The Air Force has a long history of offering courses at a distance. The key to any successful distance learning program-whether in the military or the civilian sector-is a plan, a plan written from a systems view. Such a plan will mandate the need for a curriculum analysis and media selection for each course being considered for conversion. Such a plan will require a thorough cost analysis, so the decision-maker has a realistic projection of the costs for the conversion. Such a plan will describe how instructors will be trained on how to instruct using this alternative delivery method. And finally, such a plan will call for early involvement of all stakeholders. The existence and absence of such planning documents accounts for both the successes of distance learning in the Air Force and the failures.

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Autobiographical Sketch

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Interaction Strategies for Online Training Designs

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Introduction

In the world of distance learning, very few topics have generated as much discussion and debate as has the construct of interaction. Distance learning practitioners tend to view interaction as the single most significant attribute that defines a contemporary distance learning experience. That is, the interactivity enabled by two-way technologies providing real-time exchanges of audio, video, text and graphical information among distributed participants serves as one of distance learning's primary identifying characteristics.

Interaction Agents

In attempting to bring a measure of order to discussions of interaction, Moore (1989) offered a schema in which he identified three types of instructional interactions:

- Interactions that occur between the learner and the instructor.
- Interactions that occur among learners.
- Interactions that take place between learners and the content they are trying to master.

One of the benefits that this schema offered designers, implementers and administrators of distance learning programs over the past decade is that it has provided a sense of direction to the transactions that are typically involved in a distance learning endeavor. Furthermore, Moore's interaction schema implied purpose, intent and/or intended outcome of an interaction by virtue of indicating *who or what* was to be involved in a transaction. However, the explicit description of an interaction's purposes, intents and outcomes were still left to one's imagination. Moore's schema did not really describe the intended outcomes of interactions. Instead, it identified the agents involved in or impacted by a given interaction. In other words, it described with whom—or with what—interactions will occur, within the context of a specific distance learning transaction.

Given the logarithmic explosion of technology capacities in the past decade, combined with the integration of interactive technologies in just about every facet of contemporary life, it may be that focusing on real-time, technologically-enabled interactivity as a defining attribute of distance learning may be an artifact of the past. The value of interactive technologies as a resource for extending the reach of instruction and information can now more easily emerge as a means to an end. The earlier emphasis upon the agents of an interaction can now help set the stage for a more meaningful discussion of the outcomes enabled by a variety of types of interactions.

Interaction Outcomes

When focusing upon interaction outcomes rather than interaction agents, interactions can more effectively serve as a means to the ends of learning and performance improvement. In this context, interactions have two purposes:

- They must change learners.
- They must move learners toward an action state of goal attainment.

By emphasizing the outcome of an interaction, it is easier to see the impact that an interaction has on learners. Interactions enable the active learner participation in the instructional/training/performance improvement process. They allow learners to tailor learning experiences to meet their specific needs or abilities. Interactions enable clarification of a new idea and promote transfer of new ideas to already held concept frameworks. Interactions promote intrinsic motivation on the art of a learner by highlighting the relevancy that new information may have under specific circumstances.

Types of Interactions

Wagner (1997) has identified a number of interaction categories by focusing on what learners are to achieve as a result of an interaction:

- **Interaction for participation:** Interaction for participation provides learners with a means of engagement. In its simplest state, this may mean meeting fellow learners for the first time so that the basic level at which human relationships occur is established. In its more complex states it may emphasize the willingness of individuals to assume leadership responsibilities for members of their particular cohort group.

- **Interaction for communication:** This kind of interaction features opportunities to share information and opinions, or to intentionally influence the opinions or beliefs of others, all of which are particularly germane when working in instructional, training and/or performance support settings. It includes clearly articulating expectations, offers opportunities for personal expression, encourages information exchange without fear of being judged or punished, may help persuade an individual to subscribe to a particular point of view.

- **Interaction for feedback:** This refers to any information that allows learners to judge the quality of his or her performance. Wagner's (1994) review of feedback literature refers to a variety of conditions of feedback, noting that feedback tends to be considered from two differing perspectives. From a behavioristic perspective, feedback provides reinforcement, which is intended to correct and direct performance. Cognitivists suggest that feedback provide learners with information about the correctness of a response so that they can either determine if a response is right or wrong, or to allow learners to correct an incorrect response so that long-term retention of correct information is enabled. In either case learners need to obtain information from a variety of sources (from instructors, from other learners, from their own observations, from information resources) from which they can then judge the quality of their own performance.

- **Interaction for elaboration:** From a cognitive perspective, elaborating on information (that is, coming up with alternative examples to explain a new idea, or developing alternative explanations for why an idea may be framed in a particular way) makes new information more meaningful for learners. By expanding, or even manipulating a bit of information associated with a given idea, it is easier to recognize all of the various conceptual "hooks" that may be associated with that information. The extra cognitive "practice" that results from generating alternative interpretations make it easier for learners to integrate new information in their existing cognitive framework. Learners are then better able to develop their own mnemonic devices to improve the ways that they actually process new information for long-term retention and recall.

❖ **Interaction for learner control/self-regulation:** Interaction provides learners with the information needed to manage the depth of study, range of content covered, type of alternative media needed for information presentations and time actually spent on a specific learning task. McCombs and her colleagues (1992) have noted that the depth and breadth of information processed, as well as what and how much is learned and remembered, are influenced by the following factors:

- Self-awareness and beliefs about personal control, competence and ability.
- Clarity and salience of personal values, interests and goals.
- Personal expectations for success and failure.
- Affect, emotion, and general states of mind and the resulting motivation to learn.

Interaction for learner control or self regulation is particularly important for preparing individuals to be life-long learners, particularly if learning is to take place in a distant or a distributed learning context. Learner control and self-regulation deal with the ability of a learner to keep himself or herself "on task," to mediate the need for additional information to complete one's understanding of a new idea, and to recognize when the learning task has been completed.

❖ **Interaction for motivation:** Curiosity, creativity and higher order thinking are stimulated by relevant, authentic learning tasks of optimal difficulty and novelty for each student. Intense negative conditions and emotions (e.g., feeling insecure, worrying about failure) can thwart this enthusiasm. The degree to which a learner can ascertain the presence or absence of negative factors will have a direct impact on his or her ability to learn. This is why it is important for learners to have opportunities for making these determinations through a variety of information sources, such as asking questions, clarifying statements, reviewing guidelines and so on.

❖ **Interaction for negotiation:** Determining the willingness of another individual to engage in a dialogue, to come to consensus, or to agree to conform to terms of an agreement are all examples of interactions for negotiation. Negotiations in learning are particularly relevant in a time where constructivist learning models allow individuals to capitalize upon their own (appropriate) interpretations of reality to enhance relevancy, motivation and application. Being able to clearly articulate the terms of a learning agreement sets the stage for subsequent action. If such terms have not been defined and agreed to, the likelihood of achieving a successful outcome is greatly reduced.

❖ **Interaction for team-building:** Interaction for team-building is necessary to ensure that individual members of a team actively support the goals of the group. Interactions facilitate such desirable behaviors as recognition and acceptance of individual differences, expression of respect for the team as well as for its members, effective listening, a shared sense of responsibility and the ability to confirm expectations within the group.

- **Interaction for discovery:** It is highly unusual for new discoveries to occur in an intellectual vacuum. This category of interaction refers to the cross-fertilization of ideas that occurs when people share their ideas and perspectives with one another in the pursuit of defining new constructs.

- **Interaction for exploration:** Closely related to "interaction for discovery," interaction for exploration provides a vehicle for defining the scope, depth and breadth of a new idea. Just as it is important to recognize a new idea, it is also important to distinguish a new idea from extant ideas, and to determine parameters within which a new idea will retain its unique identity. This category of interaction helps define the parameters within which such distinctions can be made.

- **Interaction for clarification:** This relates to the ability to navigate one's way through a sea of performance expectations that may or may not be clearly articulated. An example of this category of interaction may include but is not necessarily limited to determining if one's person interpretation is what another person actually intended by restating an expectation in one's owns words.

- **Interaction for closure:** Just as learners need to know where to begin a specific learning endeavor, learners also need to know when they are done with the endeavor. In an era marked by having access to almost limitless information resources, the ability to "bound" an activity is critical, whether one is writing a term paper or staying "in scope" on a contracted project. This means being able to determine what expectations exist and to also determine when those expectations have been met. It is a rare individual who can make these determinations without engaging in dialogue.

Applying Interaction in Practice

Using the categories of interaction noted above as conceptual benchmarks, it is fairly easy to make the case that interaction (in any one of its many exemplifications) is a necessary ingredient for a quality learning experience. What is not so clear, at least not when viewing interaction as an independent construct, is the value that interaction brings to a learning endeavor when interaction is viewed out of the context of a specific learning endeavor. For example, one might attempt to quantify the amount of interaction that is needed to ensure the quality of a learning experience. One may be interested in determining how often interaction should occur for a learning experience to be effective. There may even be some interest in determining what types of interaction are the most effective. However, if any of these attempts are made, it is hard to imagine that the results of these inquiries will offer any useful insights or understanding unless there is context available to help interpret those metrics.

The best rule of thumb for effectively designing an interactive learning experience—whether it happens to be distance learning, online learning or face-to-face, instructor-led learning experiences—is to first consider the goals and objectives of a specific learning experience. From this perspective, it is both far more appropriate and effective to begin the process of selecting strategies and tactics needed to achieve the desired ends of the learning experience, for the specific audience at hand, given the specific conditions likely to be encountered in a given setting. In this way, interaction can serve as an outcome of clearly conceptualized, well designed, and well developed instruction and training.

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The Role of Distance Education and Major Factors That Influence Minority Adults' Participation in Educational Programs

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Abstract

This study has been partially supported by a grant from the Institute on Race and Ethnicity of the UW System for examining the major factors, including distance teaching and learning and relevant technological innovations, that affect adult education for ethnic minorities. Data sets provided by the National Center for Education Statistics (NCES) were used to accomplish three objectives: First, to investigate the extent and scope to which the minority groups are served by adult educational establishments, including the specific needs and existing barriers for minority adults to obtain education; Second, to examine the role and contributions of distance teaching and learning and relevant educational technologies in facilitating the access of adult education by ethnic minority groups; Finally, to stimulate further research interest and draw broader attention by sharing the initial results with scholars, policy-makers, and the general public regarding issues about distance education, adult education and minority education.

Background and Introduction

During the years of 1991, 1993, 1995, and 1996, the National Center for Education Statistics (NCES) collected data through a series of national household education surveys (NHES), of which, an important dimension concerns the various activities, facilities, and environment of adult learning. In the surveys conducted in 1991 and 1995 respectively, components were added focusing on a wide range of adult education experiences. A collection of rich information was gathered from nationally sampled participants and non-participants of different adult education programs.

NHES is a telephone survey of the noninstitutionalized civilian population of the United States. Households were selected by using random-digit-dialing methods, and data were collected using computer-assisted telephone interviewing. The sample size is 25,137 cases for 1991 survey and 78,888 cases for 1995 survey, involving both participants and non-participants of adult education programs. One of the goals for NHES survey was to ensure a reliable estimates for subdomains defined by race and ethnicity. Estimates by race and ethnicity were key in developing the sample size. Blacks and Hispanics were sampled at higher rates to improve the reliability of estimates for these groups (NCES report, May 1997).

In recent years, fast technology advancement has made distance education and technology-assisted instructions an unavoidable phenomenon in all aspects of education programs, including adult education. In 1995, NCES added a group of questions which are directly asked the survey participants about whether they learned knowledge or preformed specific tasks by using computer instruction, by interactive video instruction without an instructor present; or by receiving instructions through telephone. In addition, the NHES survey coordinators informed the researchers of this article that they realize the increasing importance of distance education in adult education. In the NCES's planned 1999 NHES survey, distance education related questions will become a major section.

Linking the distance learning methods the survey participants adopted, the available data sets contain detailed rich information of the subjects relevant to this study, including ethnic background, age, gender, family economic status, the whole family's education related issues, type of adult education programs participated, courses taken, instructional methods involved (computer-assisted, video instruction, etc.), approaches used to participate (by directly going to campus of an institution, or through certain kind of distance education facilities, such as by mail, radio/television, and other means/technologies), intensity of the study (part/full time and attending frequency), reasons for taking the course(s), specific barriers to participation in adult education, and results/achievements. We have obtained permission from NCES to use the data in this study.

Research Results

Relevant Literatures

An extensive literature review reveals basic patterns of current research on ethnic minorities and their access to education. To a large extent, most studies on ethnic minorities stress the changing demographic structures and the need to be aware of the developing trend and impact on the society. Echoes are repeated among these studies that the traditionally classified minority groups are playing an increasingly prominent role in national economic prosperity and social stability. Meanwhile, accesses to education have been inadequate for minorities, especially among the adults, while their actual needs are growing continually. In this particularly crucial area, efforts of empirical research have not kept pace in terms of both quantity and scope at the general level, and even less in some specific aspects, such as improving minority access by taking advantage of today's delivering technologies.

Eight years ago, Jan Jackson insightfully pointed out that adult education in America is urgently in need of a much improved agenda as we are quickly approaching the twenty-first century (Jackson 1989). The society and the general public can benefit in multiple ways by becoming more aware of the special needs in a changing multicultural environment. It should be no surprise that what defined as minority groups today will together constitute the majority population in the foreseeable future. Meanwhile, insufficient access to education continues contributing to the limited job and life opportunities, consequent poverty, and various problems of the disadvantaged minority (Brazziel 1993; Knox 1993).

Other related studies report that generally educational services to ethnic minorities are deficient and the situation is most detrimental for the adult population. The lack of a national action to vigorously involve ethnic minorities in educational programs can be attributed to the low status of adult education, shortsightedness, biases or discrimination, and shortage of financial resources (Barrera 1994; Cassara 1991). Research findings proposed various challenges for the adult education programs in the United States to tackle in order to better serve the entire society by giving more attention to minority issues. To start with, the society need to realize that it serves the whole society better to replace the melting pot concept with cultural pluralism. Thus, persons from various backgrounds can have more appreciation of each other without forfeiting their cultural heritage. Accordingly, more cross-cultural education is necessary for all individuals to have a better understanding of each other's differences. Another challenge refers to the formulation and implementation of a national policy to provide pertinent, fundamental, and accessible educational opportunities for minority adults to make educational decisions and to empower themselves. Still another critical challenge is about establishing and maintaining dependable financing resources in a time of economic crisis, and so on (Cassara 1991).

Research continues documenting strong evidence that education, especially adult education, may provide the key to unlock and develop the under-developed and under-utilized human potentials, and eventually, get out of the impasse of impoverishment and improve the despaired situation of powerlessness. Education is responsible and capable of responding to the emerging diversity of human needs and the changing world of work. Thanks to the invaluable resources of educational establishment, the society is blessed with all the facilities for effectively reaching all individuals regardless of their age, gender, economic status, and racial background (Jackson 1989). The remarkable penetration and expansion of distance education in all levels of educational institutions have continually improved the capacity of knowledge delivery and learning efficiency. Accelerating technological advancement has greatly strengthened the institution, expanding its horizons and opening new paths with ample resources at affordable costs. Constant educational innovations, combined with the continually improved campus infrastructure, promise the most optimum learning results with the flexibility of time, location, approach, and size of audience. The literature shows that this new horizon bring new promises and encouragement to adult learners. As some of the most recent research reveals, the non-traditional students, often the minority work force members, are highly motivated for degree programs provided through by distance learning (Manzo 1997; Parrott 1994; Portway & Lane 1994; Withrow 1997).

There is an urgent need to gain relevant in-depth new knowledge in the most fundamental aspects of distance education to answer such practical questions as: Who are the current and prospective learners/users of the various kinds of distance education facilities? What are their needs and expectations in the context of fast changing socio-economic-technical background? What are the trends, directions, and changes of development of course demands and capacity of offerings from remote sites? It is therefore both necessary and plausible to devote special efforts to promote minority education for the well-being of the whole society with a long-term commitment and sharp vision into the future. As the existing research indicates, there is an apparent gap between the fast development of distance teaching and learning systems, programs, curriculum and course offerings and a good understanding of the overall structure, scope, key features, and the trend of development and potentials instructional technology applications in remote modes of teaching and learning.

As a result of the national education goals and the concern about America's ability to compete in a global economy, there has been a heightened interest in enhancing and improving access to adult learning, with considerable amount of attention on minority education as a result of the dramatic demographic changes. Meanwhile, the proportion of public funding for education is decreasing, which makes it not necessary but imperative to study the role of distance education technology advancement. Next important agenda in order is the increasing demand for effective management of postsecondary education relying on information from solid empirical data for decision-making and for guidance of innovative teaching and learning activities. Based on the specific needs of adult learners, human being's teaching and learning would see the remarkable penetration and expansion of distance education in all levels of educational institutions. Constant educational innovations, combined with the continually improved campus infrastructure, promise the most optimum learning results with the flexibility of time, location, approach, and size of audience.

Methodology

The National Household Education Survey series contain rich information about educational background, language capabilities, apprenticeship, employment conditions, job related experience and activities, and household characteristics of the adult population. Such information is available and largely consistently collected in multiple years. This paper focuses on the traditionally under-represented minority adults and the relevance of distance education facilities to their access to, and success in, formal education. For the purpose of this study, ethnic minority include all African, Asian, Hispanic and Native American adults. Key variables have been carefully selected and/or constructed while the relevant cases are divided into subgroupings for detailed examination and comparison.

Both descriptive and inferential statistics are employed for data analysis. Basic demographic characteristics are summarized using statistical charts and tables for simple presentation, comparison and elaboration. Factor analysis and cluster analysis are used to further explore the relationship among variables and to identify relevant underlying structures. In addition, canonical analysis are useful to examine the relationship between the two main sets of variables: adult education experiences and distance education facilities. A major proportion of the data analysis is performed using the SPSS, SAS and other statistical packages available on our IBM mainframe computer and workstations running the Windows version of applications. The results will be presented at the conference by charts and graphics.

The principle investigators focus their research attention on four areas. First, the course-taking formats and learning activities of adult learners, e.g., whether they take the courses by mail, telephone, television, radio, newspaper, computer or interactive videos. Second, the reasons the adult learners decide to take the courses: to improve, advance, or keep up to date on their current job, to train for a new job or a new career, to improve their basic reading, writing, or math skills, to meet a requirement for a diploma, degree, or certificate of completion, or for a personal, family, social reasons, or for any other reasons. Third, the barriers which have kept the adult learners from participating in the required adult education programs: e.g. work schedule, meeting times of classes, cost of classes, location of classes, lack of transportation to classes, lack of child care, miscellaneous family responsibilities, lack of information about available classes, classes of interest are not offered, etc. Fourth, the types of courses they are taking: e.g., adult basic skills and general education development preparation classes, English as a second language instruction, courses taken toward college degrees or vocational or technical certificate, apprenticeship programs, career or job-related courses, etc.

With the focused aim on studying the role of distance education delivery approaches, the researchers studied the relationship between the formats the adult learners take courses and their specific barriers; to examine whether distance education delivery formats have any significant impacts on their participation patterns; to examine the relationship between their needs and their participation patterns; and to compare whether the variable of ethnicity has any significant impact on their adult education activities.

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The Public Health Training Network: A Model for Continuing Education and Training

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What Is the Need for a Public Health Training Network?

The Centers for Disease Control and Prevention (CDC) has been a central source of continuing education and training for public health workers in state and local health departments since its inception in 1946. Likewise, many state health departments and academic centers, such as Schools of Public Health, have had a continuing education and training mission. This training, for many years, has been primarily delivered in classrooms, workshops or other face-to-face encounters. Fundamental changes in the American health care system increased both the number of persons who needed training and the number of content and skill areas in which they needed training. At the same time, federal, state, and local public health agencies were all faced with declining budgets. They found they were unable to meet the increasing demand using traditional methods.

CDC explored the need for a different type of training with many of its partner agencies. In 1993, the Public Health Training Network (PHTN) was launched. Founding partners included the Alabama Department of Public Health, Association of Schools of Public Health, Black College Satellite Network, Department of Veterans Affairs, Food and Drug Administration, and the U. S. Department of Agriculture (Centers for Disease Control and Prevention, 1998).

The PHTN Operational Components

The PHTN operational components consist of seven steps. By continually *assessing* training needs of current and future audiences, the PHTN ensures that the curriculum offered addresses priority, job-relevant training needs. PHTN *develops* training products to meet identified needs using the most cost-effective methods to move information and ideas rather than people. PHTN products include interactive multimedia, videotapes, audioconference and satellite videoconferences, as well as print-based self-instructional courses. Instructional specialists from CDC work with content experts at CDC as well as at Schools of Public Health to develop products. Through these cooperative efforts, practicing public health professionals nationwide have received valuable knowledge efficiently, effectively, and economically.

PHTN *announces* its training products through a variety of resources. CDC provides a toll-free 800 number, a PHTN web site (www.cdc.gov/phtn), and a catalog—both in hard copy and online. Additionally, each state has designated a Distance Learning Coordinator, most often from within a state health department (Centers for Disease Control and Prevention, 1997). Each Distance Learning Coordinator (DLC) promotes and announces training products through appropriate publications, including web pages, in ways that fit their states' staff and partners. The DLCs are frequently the only people in health departments who understand both public health programs and technology, such as satellite programs, telemedicine/telehealth, community information systems, or compressed digital technology

(Dillenberg, 1997). In other words, the DLC is the person who combines an understanding of program content with distance learning technologies.

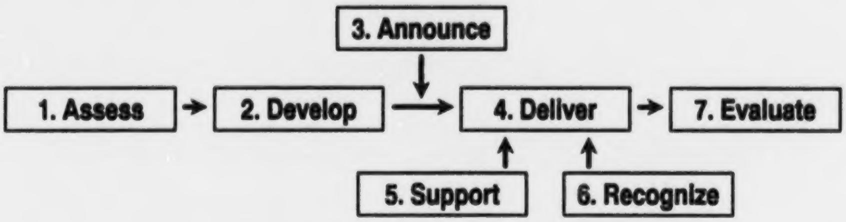

Figure 1. Public Health Training Network process.

Products are *delivered* to learners with a wide-range of public health responsibilities and in widely dispersed locations. PHTN provides a toll-free 800 number and on-line information to facilitate ordering print-based courses, interactive multimedia, 35 mm slide series and videotapes. The DLCs and other state-based partners arrange for downlink sites for satellite programs, for site facilitators, and for distribution of pre-course materials. CDC makes videotapes of satellite programs available for those who were unable to participate in the live event (Centers for Disease Control and Prevention, 1997). Recently CDC has begun to Cybercast some of its satellite programs as well.

Program delivery is not limited to the United States. Public health workers in Canada have been regular participants in recent PHTN satellite broadcasts. PHTN is currently seeking someone to serve as a DLC for Canada. CDC has also received requests for Spanish-language programming from as far south as Peru. To meet this demand, CDC is beginning to broadcast some programs in Spanish, using a satellite with a footprint that includes northern Mexico, Puerto Rico, and the Caribbean basin (Centers for Disease Control and Prevention, 1998a, April).

Support to learners is provided through a variety of mechanisms. PHTN promotes learner communities that include DLCs, satellite site facilitators, or self-study group leaders. Learners receive *recognition* through a certificate of participation and may receive recognition such as Continuing Education Units (CEU), Continuing Nursing Education (CNE) and Continuing Medical Education (CME) credits.

PHTN training is *evaluated* at all stages of development and delivery. Formative evaluation is used during the development of training, while process evaluation is carried out by collecting information about participants, state training coordinators, and site facilitators. Learning outcomes are measured through final exams (Centers for Disease Control and Prevention, 1997). For example, 20,000 people registered for a September 25, 1997, broadcast, *Vancomycin-Resistant: Control of an Emerging Pathogen (VRE)*. Approximately 3,800 sent in a scan form to receive course credit. Prior to viewing the program, 53% of the responding audience demonstrated knowledge of VRE facts, while after the program 97% of the group demonstrated VRE basic knowledge (Centers for Disease Control and Prevention, 1998, May/June).

Cornerstones of a Training Network

In five years, PHTN has grown from simply an idea to a mature training system that has served over 300,000 public health professionals. What is responsible for this success? PHTN works because of partnerships and networks. Other professional groups which envision a similar national distance education network model need to give consideration to replicating these cornerstones.

From its inception PHTN has relied upon partnerships and collaborations. CDC had a Division of Training and Media, but others such as the Alabama Department of Health had expertise in satellite program delivery. The states supplied DLCs who had expertise in communicating with and promoting training programs to state and local public health workers. The Association of Schools of Public Health was another source of public health practice and research expertise.

Through PHTN's first five years, partnerships became even more important. State health departments that produced satellite program began to share those with their sister states without a fee. At the federal level a Distance Learning System Work Group, established in 1996, created a plan, *Distance Learning in Public Health*. This plan envisions a "distance learning network of the future which requires a united effort among partners involved to yield a universally (i.e. geographically, economically, and culturally) accessible distance learning network that is seamless (i.e., supported by a common distance learning support system for such functions as registration and accreditation); that is technically interoperable so that each of the parts of the network can talk to each other; and that is internally coordinated across agencies, to ensure that partners eliminate duplication and prevent conflicts. Collaboration will be the key to developing such a single, effective distance learning network" (Centers for Disease Control and Prevention, , 1998b, April). A 1998 revision of the plan embodies two important additional components: a strategy for better-articulated field operations and a commitment to solving learner support problems.

Training products on the shelf or even on a satellite do no good. Learners must know about these training products before they can use them. Getting information out about programs is the goal of a network. At CDC, the field operations office originates a calendar that shows all audioconference and satellite programs. A uniform calendar helps groups to schedule events that will not conflict with other events. CDC shares this calendar in hard copy with DLCs and also places it on its web page. In addition, detailed information about each audioconference or satellite program is made available by the CDC field operations office to the state DLCs. DLCs in turn spread this information throughout their states. Feedback about programs comes from the DLCs back to the CDC field operations office as well. The DLCs also share expertise with each other.

Summary

The Public Health Training Network is a system that brings public health training to learners nationwide. Seven operational components are implemented through a strong network, consisting of CDC staff and state-based Distance Learning Coordinators and through successful partnerships. Other professional groups seeking to build a national training effort will need to consider how they can utilize partnerships and build networks.

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Autobiographical Sketch

Lorene (Lori) Wedeking is the Distance Education Coordinator for the Minnesota Department of Health. She manages videoconference and audioconference services, satellite program receipt, and satellite uplink program development. She is the Minnesota Distance Learning Coordinator for the Public Health Training Network. She holds a BSN from the University of Iowa, an MS from the University of Minnesota, and is a doctoral student at The Graduate School of America.

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Making Choices, Taking Chances, Facing Challenges, Managing Change: The Implementation of a Voice/Video/Data Network at the Alliance Library System

Valerie J. Wilford, Executive Director, Alliance Library System
Lee Logan, Library Development Consultant, Alliance Library System
Lori Bell, Automation/Technology Coordinator, Alliance Library System
Kay Cloyes, Technology Consultant, Alliance Library System

Making Choices—Valerie J. Wilford

The Alliance Library System (ALS) is one of twelve regional library systems in Illinois, providing a full spectrum of support services for 300 member libraries of all types (public, school, academic, and special) located over a 14,000 square mile area in west central Illinois. Services provided include delivery of materials, consulting, continuing education, grant assistance, back-up reference and interlibrary loan, technology services, and coordination of cooperative projects such as group purchasing. ALS has four service centers, located in Pekin, Galesburg, Bloomington, and Quincy. Each center has a small computer training center, a videoconference meeting room, and a large meeting room for continuing education and meetings. ALS is funded through the Illinois State Library, a division of the Office of the Secretary of State.

ALS was formed in 1994 and was the product of a merger of four much smaller regional library systems. Library members, ALS staff, and board were concerned about the large geographical area covered by the system and the provision of services offered over a large service area to the many libraries. During the merger, town hall meetings, focus groups, and other types of information gathering was done to assist the Transition Board in making decisions about how services could best be offered.

The first step taken by staff, under the leadership of Executive Director Valerie Wilford and Library Development Consultant Lee Logan, was to design, purchase, and install a phone system. This way a librarian could call one toll-free number and reach any service center or staff member no matter where they were located. A Toshiba telephone system was purchased and installed and the service centers were connected by tie lines so that calls coming into one service center, could be easily transferred to the other service centers. This worked very well, but it soon became evident that more was needed.

Staff were spending hours on the road traveling to service centers to replicate continuing education events and consulting appointments. If an event could only be held once at a single location, member librarians became discouraged with the amount of driving involved to attend that particular meeting or event. There were also problems with staff sharing data files, internal communication, and each staff member having to dial into the Internet. It was at this point in 1995 that investigation into an integrated voice/video/data network began.

Valerie Wilford appointed a team to begin investigation of options of an integrated network. The team included Lee Logan, Lori Bell, Automation/Technology Coordinator, Kay Cloyes, Technology Consultant, Ted Matheny, Network Manager, and Karen Michaelson, Technical Support Manager. Each staff member had a different background to bring to the project.

Taking Chances—Lee Logan and Lori Bell

The first activity which took place was the planning and implementation of a client/server Novell Network in the Pekin service center with smaller peer-to-peer networks in the other service centers. Since the tie lines connecting the phone system would not carry much data effectively, staff at the other service centers dialed into the Novell server to transfer files and use GroupWise software for communications. For Internet service, they were also dialing into the ALS Internet server.

The staff then began investigating videoconferencing possibilities. CUCMe was considered as an Internet option on the desktop. At the time, the standard speed of transmission over a modem was 14.4, video quality was poor, although sound was acceptable. There was much discussion about this product, and it was decided that the quality of the transmission would be even more discouraging to members than the travel to come to an event. The staff also looked at desktop units which seemed to work well with acceptable quality and transmission over an ISDN line; however ISDN lines were not available at that time in two service center areas so that idea was abandoned. The team then began to look at what seemed to be "Cadillac" systems, dual-monitor Picturetel and VTEL units with 23 and 28 inch monitors which worked over fractional T1 lines (384 speed, the equivalent of 6 64 kps lines or 6 channels of a T1 line). The team talked with a number of vendors about videoconferencing products and became frustrated with the lack of a standard, proprietary equipment which would not work with other systems, costs, and a consistent lack of knowledge by many of the vendors which would be involved in a videoconferencing project. Hours were spent discussing various options and whether or not ALS should buy its own multi-point-control (MCU) or bridge or contract for this service. Staff contacted vendors and quickly became discouraged at the hourly cost for each site for a videoconference ($40-60 an hour per site). These prices seemed to prohibit testing, experimentation and an in-depth learning experience of the system.

The staff team found a vendor which was most helpful and knowledgeable in assisting them in formulating a plan for an integrated wide area network; selected proposed videoconferencing equipment for each office with costs; included equipment such as routers needed for a wide area network and Internet services; and proposed an upgrade for the phone system which would work on the network. The staff was ready to make a presentation to the ALS board when the Illinois State Library initiated a plan for a statewide library system videoconferencing network. Suddenly, the plan changed! The Illinois State Library selected videoconferencing equipment for the whole state and provided a grant to assist systems with the initial costs. ISL also worked with ALS to obtain bridging services from Central Management Services (CMS) so that all four service centers could connect or any one service center could connect with other sites on the CMS network. There was a monthly charge which included costs for T1 lines to the video network; unlimited connection time and bridging services; and support. Little did staff know at the time how much support would be needed. The proposal was rewritten, optimistically titled "Network 97" and approved by the ALS Board of Directors.

Facing Challenges—Lee Logan and Kay Cloyes

The first step of implementing the integrated WAN was to get all the vendors together to communicate with each other, hopefully understand the project, and work together and to create a project timetable. This included a telephone service vendor; a telecommunications vendor; a network vendor; a Madge equipment vendor; a videoconference vendor and the staff implementation team. At the first meeting, vendors spoke to each other in the technical lingo involved in each of their specialties with ALS staff as uncertain interpreters. This turned out to be an excellent strategy as a tight timetable had to be created with all vendors working together. A week was chosen for network equipment installation; Madge equipment installation; and the telephone equipment upgrade. Each staff member was given an assignment for coordination. Tempers and tensions ran high with the pressure of the equipment installation and implementation. At the end of the week, members and staff could use the phone system and communicate successfully over the Novell network without having to dial in. Because of its integration, all lines and services had to run through the Madge "boxes" located at each office.

Little did the staff know that the implementation of the voice and data components of the network were a piece of cake compared to the videoconferencing implementation. Technology Consultant Kay Cloyes and Technical Support Manager Karen Michaelson took the lead roles for the implementation of the videoconferencing for all four offices which took huge chunks of time and patience over a period of September-December 1997. One of the problems was the number of vendors involved in the project. No specific vendor wanted to take credit for the problems with the video system; passing the blame became a way of life. Since finding expertise in this area was difficult, staff were totally dependent upon the vendors. Phone bills were high; with one vendor, each time they had to communicate, it was with a different representative; this vendor did not want to send anyone on-site. Phone lines were tested and retested. The videoconferencing system seemed like a teenager in angst; one day it would work well, very well, and the next day it would not come up at all. There was no rhyme or reason as to why this would happen one day and not the next. It seemed the main problem was that although other videoconferencing networks existed, they were not on the new "switched" technology with the Madge boxes. Other networks had full T1s dedicated to video and "closed" networks in which their systems could not talk to other systems. Finally, the system evened out and began working consistently.

Managing Change—Kay Cloyes and Lori Bell

The implementation of the videoconferencing system brought a welcome change, addition, and format for ALS continuing education events, consulting meetings, board meetings, advisory meetings, you name it. Of course, the first group to experience the video system was the ALS board during the early cold winter months of 1998. ALS board members represent different geographic areas of the system and so no matter where the meeting is held, someone has to travel. The board members loved going to their nearest service center for a meeting!

Kay Cloyes planned an aggressive training program for staff on all levels. She taught staff how to operate the system using the keyboard, the remote mouse, and the Pen Pal. She held sessions on how to put Power Point demonstrations on the system, worked with Ted Matheny, Network Manager, on putting the video units which have a pc base on the

Internet so Internet demos and training could be scheduled. Kay also developed documentation to assist video operators.

Valerie Wilford appointed a committee to develop a videoconferencing policy for use by the System, system members, and outside groups. The committee involved the staff network team, Service Center Managers, and other staff. An in-depth comprehensive policy was developed and approved by the ALS board.

The real debut of the videoconferencing system was March 4, 1998 with a continuing education event on an ALS digitization project. Lori and Kay developed a schedule and a script and provided speakers with an agenda for the meeting. There was a video operator scheduled at each site as well as speakers at each site. At the first meetings and continuing education events, there was little interaction. It was obvious that people were fascinated with the interactive video but were also intimidated by it. Interaction, questions, etc. were requested from each site. Since that time, many meetings and events are scheduled on video. Some librarians are reticent to attend an event if it is not on video because they like the convenience of traveling to their nearest service center.

No one knows where the teen-age angst of the videoconferencing system has gone, but there is no doubt everyone hopes it is gone for good.

Autobiographical Sketches

Valerie J. Wilford is Executive Director of the Alliance Library System since 1994. Before that, she was Director of the Illinois Valley Library System and taught Library Science at Illinois State University for seventeen years.

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Distance Education "Lifeguards": Saving Students From Traditional Waters

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Introduction

The University of Arizona (UA), School of Information Resources and Library Science (IRLS) is at the forefront of distance education providing students in all geographic locations an opportunity to earn their Master of Arts degree in IRLS. To obtain courses virtually, students must have graphical web access and meet certain computer requirements. Both resident and non-resident students participate in course work distributed over the Internet and utilize a combination of tools including World Wide Web (WWW), e-mail, conferencing network, newsgroups, Internet Relay Chat (IRC) and other environments. Planning is critical to the long term success or failure of any program. The Upper Administration of an institution often establishes policy and procedure, but the support and implementation of that program is in the hands of departmental staff. The traditional structure and organization of many higher education institutions is often unyielding and unwieldy, thereby making the job of the implementers frustrating, however; this process can drive creativity and aid in the success of a program.

Discussion

Some universities and institutions of higher learning have specific units or departments that control the logistics of courses taught at times other than during the day, or taught by methods other than in the classroom. These units are called Extension Programs, Continuing Education Programs, Continuing Adult Education, etc. in most instances. These units tend to house programs offered by the university for the community at large, more non-traditional courses in technology, self-improvement and the like. They also assist academic departments by aiding students with registration, advising, and guidance. In the case of the UA, this entity is called the Extended University (EU). Any course not offered in the traditional manner is offered through EU. EU is then responsible for registration, collecting payment, and payment of instructors. There are no traditional UA academic units offering course work completely over the Internet, at this time, other than IRLS. Portions of some classes (i.e.: exercises, quizzes, homework) are supplemented via this medium. The UA Administration hasn't yet made university-wide arrangements or means for the option of offering course work in a completely virtual environment. Because IRLS has already taken this step, the program must work with policies and procedures written for programs with different needs and objectives.

Registration

Significant challenges come to light when trying to utilize a structure developed for programs with different needs and objectives. For instance, traditional students register for classes via an automated telephone system. This process is immediate and very accurate. Should there be a problem with the student's record, the system will alert the student and the student can walk to the Registrar's Office to clear things up in person. Initially, IRLS utilized the registration process offered by EU. This is a manual process, and so many different offices are involved besides IRLS and EU, that the process was not satisfactory to the needs of our students. Students were registered late or sometimes not at all.

Additional problems arose regarding securing email accounts for these students, allowing them access to the UA systems, and getting grades and transcripts completed in a timely manner. Most of these problems were due to an initial oversight in the student's overall admission to the program. Through several meetings and working closely with EU, IRLS was able to enable students to register via the automated telephone system, rather than over the telephone through a representative of Extended University. IRLS classes are not registered in the "Distance Learning" program any more, but rather through "Evening and Weekend (EW) Campus" program. This way, the student can register via the automated phone system and any errors with the record are caught by the system. The student's registration is checked by the system, and if there is a problem, an automated voice comes on and asks them to contact the department. IRLS staff is then able to act as liaison for the student and assist with correcting any problems. This process ensures timely registration for the student, access to email accounts, and other amenities offered to traditional students on campus. The program isn't really EW program, but is utilized to care for IRLS registration needs. This is an example of utilizing a system not designed for distance education purposes.

Marketing

A virtually based program seeks and attracts both traditional and nontraditional students who are looking to further their education in an environment which will allow them to realize several personal goals. Some of these goals might be: to remain at home, to keep a current position of employment, and/or to study and participate in the course at one's convenience. At the same time, the student wants a rigorous learning experience provided to them. Our program supports students who otherwise would not be able to complete a program due to their personal circumstances or the prohibitive distance to a quality program. We offer course work online via the Internet, thereby making it available to anyone meeting the admissions and technology criteria established by our program, regardless of geographic location.

Advertising of our degree and course work is accomplished by predominately electronic means. Our discipline fosters a close relationship between information science, information seeking behaviors and library science. As the Internet becomes a larger part of the information network for all levels of education, it is important that a program be visible, easy to locate during online searching, and provides answers and information for prospective students. We promote the School through several different means: lists, Internet search engines, postings, word of mouth, and our alumni. However the students our program attracts usually find us online, so the best place to market our program is electronically over the Internet. The main form of advertisement is via the World Wide Web (WWW). The IRLS works diligently to keep its website (see http://www.sir.arizona.edu) current and active. New information or changes in program policy and procedure are posted immediately and marked up to the website. Application information is collected and analyzed on a monthly basis to see how prospective students hear about the program. Most of our inquiries come to us via the WWW and electronic lists and publications.

Communication

IRLS communicates with distance and resident students electronically via a general list, class lists, and the web site. All changes in policy and procedure pertaining to the program are announced to the general school list. Students are responsible for information posted here just like they would be if it were mailed to them in the US mail. This list provides a means of tracking students' email addresses, as staff is able to request a list of all subscribers. It is important to keep lines of communication open and to keep the student body well informed regarding issues, which will affect their degree.

Syllabi are included on the IRLS site and provide students with communication for classes. Class lectures for our virtual offerings are also linked here. The faculty incorporate several different links to web based information regarding UA policy, library online sources and courses readings. These links to other sources allow faculty to provide students access to materials and information for class and projects without having to have class notes and textbooks shipped to them, thus cutting down on expenses for the student. The syllabus is a live document and faculty can make additions and corrections or changes to the document at any time during the semester, without having to make a new copy for every student in the class.

By having the syllabi online, prospective students can see what IRLS has to offer prior to requesting an application. An archive of the syllabi is available, allowing readers to follow the history and evolution of the program. The department is able to save postage by pointing prospective applicants to the web site for comprehensive information concerning course content and program offerings. It is a future goal of the program to have the entire application package available as a downloadable file.

The website and the list are used as a means of relaying information, policy and procedures to students. The School utilizes electronic lists in place of memorandums and letters. In the beginning of each semester, every course establishes a class list. These lists are used for facilitation of class discussion, announcements and reminders. The School also has a general list that promotes intellectual and social discussion amongst the students. Topics of discussion range from copyright issues, intellectual property and censorship issues to looking for roommates, childcare facilities and social arrangements. All students in the program are required to subscribe as soon as they are admitted to the program, and applicants to the program are encouraged to subscribe as a means of "getting a feel" for how the program runs. Information from this list is archived on the University's main computer and is also set up as a newsreader. There are several ways to access pertinent information regarding the School, all gaps are filled and information available electronically. Students find the information available in several formats.

The School has worked continuously and persistently with the Center for Computing and Information Technology (CCIT) in rectifying several problems. Initially, students in our program were unable to sign up for University of Arizona email accounts. As paying students in our program, this is something they were entitled to have. Much information students needed to access was unavailable to them, unless the account from which the request came was a University of Arizona domain. Initially, none of the distance students were able to access information from the library, a tragedy for our program. To rectify this, the School sent lists of names and social security numbers for all our off campus students to a particular office and the accounts were added manually. This would take up to three and four weeks from the beginning of the semester, and students would not be able to access information they needed, hence falling behind in the class. Those students on campus were able to retrieve the information needed, an unfair advantage. The School then set up it's own server and gave students access to it as a means of signing up for email accounts via a UA domain. Finally, we were able to convince the University to establish a security system that allows our students to sign up for a UA email account from any domain. A student can access his local service provider and Telnet into the University system without being charged a long distance call. The development of this procedure took four semesters.

Technology Requirements

Due to the evolution of technology as it relates to computers, access, and the Internet, planning is a constant challenge and requires evaluation of the administrative policies and procedures guiding the program from semester to semester. Staff takes into consideration technology and software advancements as they relate directly to the students and their learning environment and thus free up the faculty, allowing them to focus their efforts on the intellectual content and mentoring of the students in the program. Students need to be able to evolve with the advancing technology and also the curriculum as they advance through the program. Development of an online resource guide has been instrumental in guiding both applicants and new students through the technological web of terms, applications, and electronic and campus resources. It also provides them some of the basic but necessary tools, which will lead to success in the program.

The School is very clear in all published information pertaining to the requirements for admission to the program technologically as well as academically. However we presently have no means of testing the technological prowess of the students who apply to the program, we have to rely on them providing us an accurate self-assessment. We do require each applicant to submit a letter of introduction, part of which must address computer skills. If the student does not meet these requirements, but is otherwise admissible and a strong candidate, provisions must be made for support and assistance. Support is offered to on campus students in a two-day orientation session, prior to the commencement of the semester. The session covers several topical areas with which the student needs to be competent to perform well in the program. These include Email, overview of IRLS Web Site Resource, Survival Tips in the Library, Searching the Internet and Evaluation of Websites, FTP Instruction, HTML Instruction, and information pertaining to internships, job opportunities, and fellowships. The School's staff is currently working on developing an online orientation for first time virtual students. As a rule, virtual students are much more adept technologically than are those students on campus. Nevertheless; the School would still like to present some sort of introduction to the program for the virtual students. As a first step, staff created the IRLS Resource Guide (http://www.sir.arizona.edu/school/resource.html), also referred to the Electronic Life Preserver. Both applicants and newly admitted students are encouraged to read through and utilize this guide as a tutorial. In time, a more comprehensive plan will be developed and mounted on the web site.

Advising

Advising students not on campus can present many interesting challenges. One of them is making the student feel connected with the institution. The School uses several methods to accomplish this. For instance, during the spring semester, the students as a whole felt they should foster a sense of camaraderie and share ideas between themselves. Traditionally, interaction of this type would occur immediately following class, or at a particular time afterwards having coffee together or meeting for lunch. This is not a possibility with our virtual contingency. With the help of the staff this current semester, a "virtual happy hour" was established for the School. General topics discussed have been copyright issues, intellectual property, curriculum issues, internship opportunities, and other areas related to the discipline. The topics are not limited or selected by the faculty, rather the students among themselves decide the topic of discussion. This method of communication is also used one on one for advising students in the field. Staff and faculty can set office hours virtually or schedule to meet with students as an appointment. The live time interaction proves most beneficial in making students feel more a part of the program. The School also utilizes email and list communication.

Residency

In offering a virtual program, the question of residency usually arises. The School has found this obstacle to be one of the most insurmountable for prospective students. At this time, there is no program in Information Science or Library Science, which offers a completely virtual degree. Every program has a residency requirement. Some programs require the student to spend a portion of each semester on campus, some programs require an entire semester on campus, other programs require students to fulfill the requirement by a combination of means. We have structured this program to be as flexible as possible within the requirement of twelve units in residence. To try and ease the financial burden on the student, the School offers a full semester's worth of courses in the summer which includes a three week pre-session and two five week sessions. Students can attend courses for resident tuition during the summer months. Students can complete all or part of the residency requirement during this time. Classes are offered during the fall and spring semester one night a week for the full semester. Virtual students living within about a one hundred-mile radius make the drive to campus one night a week for fifteen weeks. A short course is offered during a one-week winter session. Students can complete three units of residency during this week. The progression through the degree must be completed within six years. Students use many combinations of the above to complete this requirement. At times, however; this requirement prohibits otherwise very qualified students from making application. The School has been encouraging the higher administration to review the residency policy for the master's level of education. Is it necessary that students actually spend time on campus at the master's level?

Future Plans

The future of education is changing rapidly. More and more universities and institutes of higher learning are researching the different means by which education can be offered. With the explosive growth of the Internet and the various ways this medium can be used to facilitate learning, it's only a matter of time before more and more students are able to gain an education via this mode. It is important for university administrations to be aware of the potential for growth in this area.

Autobiographical Sketches

Sue Fitzner has over ten years experience in higher education. She brings considerable experience in management, distance education administration and Internet teaching. She has been a consultant, administrator, on-line instructor and classroom instructor. She has served as a teacher of training sessions for IBM executives and developed Internet training modules for K–12 teachers.

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Kathy Wilka has worked in higher education for over ten years. She earned her master's degree in education through a distance program with Northern Arizona University, giving her a unique perspective of the problems and struggles of the distance student. She advises both prospective and current students regarding program policy and interpretation, providing a vital link for students not on campus.

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Design Considerations for Enhancing Confidence and Participation in Web Based Courses

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In 1997 The University of Wisconsin Learning Innovations Center was created to serve UW System faculty and academic staff in the development, distribution and support of technology-enabled learning products and services within and beyond the borders of Wisconsin. During the past year, it has worked with the UW Collaborative Nursing Program in the development of five WWW delivered professional nursing courses. The first of these was N317 Health Assessment, developed in Lotus LearningSpace and delivered to 16 isolated professional nurses located throughout Wisconsin, Michigan and Minnesota using a Lotus Domino web server.

UW Learning Innovation's instructional design model for web delivered courses incorporates a range of collaborative discussions and interactive experiences for the learner. In addition, these courses capitalize on the multimedia learning environment that the World Wide Web offers to accommodate many kinds of learning styles. The following overview highlights the translation of this model into specific online learning activities in the development of the 15-week Health Assessment course.

Design Guidelines

Structuring Weekly Learning Activities to Enhance Student Motivation and Participation

Delivering adult professional development courses asynchronously over the WWW involves many instructional design issues. This overview of the design of the Health Assessment course will focus on six design guidelines that were used for structuring weekly learning activities to enhance student motivation and participation:

- Build up user confidence with technology
- Build in the instructors presence and personality
- Provide a clear set of learning activities
- Build on personal and professional experience of participants
- Relate content to real situation using case studies and simulation
- Build in collaboration and facilitated team projects

Application of Design Guidelines

Build Up User Confidence With Technology

Student participation in web delivered courses relies on three interdependent technologies: the learner's computer equipment, the user's Internet access and the usability of the hyperlinked WWW learning environment. UW Learning Innovations offers telephone helpdesk support for all distance learners. This has enabled course developers to focus their attention on helping learners gain confidence with the web interface itself and to rapidly interact with online learning activities. The practicing adult nurses registered for the Health Assessment were primarily in rural areas, had low self-confidence with computer technology, and had demanding personal and professional schedules. Keeping this in mind, the course was designed to build self-confidence through a series of 'scaffolded' learning activities.

Each of these activities was presented in a step by step fashion that provided all the resources necessary to enable the student to successfully demonstrate key online competencies such as contributing to a discussion, responding to a comment, and submitting an assignment. In this manner, the first two weeks of learning activities started by slowly increasing engagement with course content so that learners became confident with their online skills before being asked to perform more demanding cognitive tasks.

Build In the Instructor's Presence and Personality

The social dimension of asynchronous learning is critical to instructional effectiveness. Individual success or failure in a course often depends upon the extent to which students feel a sense of community (Wergrif, R., 1998). When understood as socially situated, learning can be viewed as a process of becoming part of a community of practice. (Lave and Wenger (1991) . The first step to creating a sense of an online community is the projection of a "human face" to personalize the technologically mediated course content.

In the Health Assessment course, this was done in several ways. The home page of the course had a weekly announcement from the instructor. These informal, yet helpful course updates helped project a human presence into the course that let the students know that she cared about their success with both the technology and coursework. In addition, though she was not a part of the over 600 discussion comment made between students, she did address each student's discussion comments three times during the fifteen weeks besides responding to their private assignments.

Provide a Clear Set of Learning Activities

The development and use of hypertext based learning environments has been widely researched. Common to many of these has been the discussion of how best to enable the learner to effectively control the alternative informational pathways. Land, & Hannafin (1996), and Horney, et. al (1994) concluded that effective use of hypertext systems requires a sense of purpose while utilizing linked learning resources. In the Health Assessment course, students were presented with a clear list of learning tasks to help them avoid the confusion and disorientation similar to that found by Gail and Hannafin (1994).

Weekly learning activities were listed on a single page as a checklist. From this list, students linked to separate lecture, case study, and discussion pages. Not only did this list serve to anchor the weekly activities, it helped busy professional nurses plan their week to stay on task no matter what time of day they logged on. Students understood clearly that there were deadlines for submitting discussion comments. While this was highly proscriptive, it allowed students who were novice WWW users to gain control of the interface, quickly build confidence completing the required activities and benefit from active discussion participation by all class members.

Build on Personal and Professional Experience of Participants

Asynchronous, network-delivered professional courses have been shown to support the development of content expertise and facilitate reflection about practice. (McMahon (1997), Honey & Heriquez (1993), Roupp et al., (1993)). Student contributions of professional experiences were central to the Health Assessment course. At the beginning of each week, each submitted a short discussion comment from his or her clinical experience. Students also participated in large and small group discussions that interwove their clinical experience with the preferred practice discussed in the readings, lectures and case studies. This type of facilitated reflection worked well in Lotus LearningSpace because the CourseRoom (threaded discussion area) is closely linked to the text and multimedia resources of the MediaCenter.

Relate Content to Real Situations Using Case Studies

Nursing education has traditionally used clinical case studies to illustrate both the content and methodology of preferred practice. The use of case studies in a hyperlinked or multimedia delivered learning environment has been shown to significantly improve the quality and motivation of the learning experience (Jarz, Kainz and Walpoth 1997).

In the Health Assessment course, the presentation of online reading materials, graphics, audio and WWW resources was done within a tightly organized sequence of clinical case studies. These illustrated case studies did not try to duplicate the accompanying textbook. Instead, they served to highlight important concepts that linked the professional clinical experiences to the threaded discussions. In this manner the presentational and collaborative elements of the learning environment served to engage the students in achieving the culminating learning objectives.

Build in Collaboration and Facilitated Team Projects

Positive interdependence underlies the successful application of collaborative learning principles. (Johnson, Johnson & Smith 1991). The benefits of online collaboration in Internet based education has been widely researched. The core of UW Learning Innovation's instructional design model incorporates the most successful findings of this research. The Health Assessment course was built around a series of weekly discussion activities that engaged the students in critical examinations of comparative clinical experiences. As part of a group reflective activity, each student was able to widen their professional understanding of how the health assessment skills described each week applied to a variety of clinical settings.

Discussion activities also took place within the unique private team rooms made possible by Lotus LearningSpace. Each student's logon identity allowed him or her to only see the 'conversation' between their team members. In this manner, the depth and meaning of each team member's contribution was enhanced and responded more directly to.

Evaluating the Results of the Application of Design Guidelines

UW Learning Innovations has developed a multilevel course evaluation process that seeks to assure all stakeholders involved that its courses are of highest quality. Educational effectiveness is assessed at the student level by a combination of contribution analysis, end of the course student surveys and extensive reviews of student technology support reports. At the instructor level, evaluation is done of course design and development process including the success of the instructor training activities. At the client level, evaluation is done of the overall efficiency and cost effectiveness of the entire development and student support process.

To date, the course design guidelines highlighted above have been done primarily at the student level. All of the students participating in the Health Assessment course completed the course. Contribution analysis showed that the median number of contributions during the 16 weeks was 40 per student compared to the 44 required by the instructor. Though participation during the second half of the class was less than the first, there was less variation between members.

Student surveys were returned by over sixty percent of the students. Most survey questions regarding course design issues received overwhelming positive responses. All students reported feeling comfortable performing learning activities within three weeks or less from the beginning of the class. They felt that the lectures and case studies were clearly laid out and that the graphics (over 110 total) were worth the download time. Activities that sent students to other WWW resources were found very helpful by some and somewhat helpful by others. The survey question that asked "what aspects of this course helped you feel you were part of a community of learners?", returned a variety of positive responses. All of these involved student's comments supporting the use of collaborative discussions and teams. In addition, the use of weekly announcements by the instructors was universally praised as very helpful. Finally, the structuring of the course around a weekly checklist of activities was universally praised as contributing to helping students keep up with the very demanding course material presented.

Professor Scheibel evaluated the success of her course and the design of the learning activities in the following words:

> Learning is not done in isolation but is best done when attached to something we already know. It is also enhanced when active participation of the application of the learning is done. The design I choose to use allowed each of these elements to assist the learner in mastering the information. The personal experience gave the student a framework in which to place the new material. The mini lecture showed the thinking of the teacher-role modeling for the student the application of the knowledge. The collaborative activity allowed the students to work in teams to engage their learning with each other and validate these skills amongst themselves and then share them with the wider class. Finally the individual activities allowed students to gain expertise in applying the information learned to an individual patient in a real

setting. The students found this design well suited to their needs. They engaged in the activities and did well on examinations and on assignments.

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Autobiographical Sketches

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Keeping the Thread: Helping Distance Students and Instructors Keep Track of Asynchronous Discussions

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Introduction

Asynchronous Learning Networks (ALNs) are a system of distance education in which the instructor and students interact through computer conferencing software and modem or network connections. An ALN is characterized by interactions that follow a many-to-many pattern (teacher and students "talking" to the entire class, and to individual students at the same time). This is unlike conventional face-to-face graduate school classrooms in which there is typically a one-to-many interaction (from teacher to students) with only occasional one-to-one (student to teacher) interactions.

ALNs are well suited to the delivery of instruction to students in widely separated geographic areas because there is no need for students and teacher to be together in one place at one time. Students and teacher can log in to the computer-mediated classroom at any time and send messages to each other with the certainty that their messages will be delivered to their recipient(s), and that the recipient(s) will read and respond to them at some time in the future.

Because of this interactive pattern, ALNs have been associated with constructivist learning methods in which the teacher acts as a more capable peer (MCP) (Vygotsky, 1978) to assist learners as they actively negotiate an understanding of curricular content. This instructional method has also been described as "discursive" (Laurillard, 1993).

Successful learning in a discursive interaction demands that the interactants are able to "follow" the interaction from its beginning to its end. This is because the discursive negotiation of understanding may traverse a very circuitous path as the teacher and students search for ways to communicate and understand embedded concepts, knowledge and skill. In the course of this, interactants develop ad hoc terms, and phrases to describe very personalized examples and inside-humor that are hallmarks of this kind of interaction. Entering such a discursive lesson part way through, and without the historical knowledge to decode the dialog might leave the learner lost and unable to understand the conversation.

However, in face to face interactions, there are many tacit verbal practices that permit interactants to keep track and update, or even to repair gaps in understanding, in a conversation (Hutchby & Wooffitt, 1998). Many of these practices are founded on the serialized turn taking of face-to-face interaction (Hutchby & Wooffitt, 1998). ALN instruction that follows a discursive method imposes similar demands on students and teachers, but unlike face-to-face interaction all messages in an ALN are not serial. Instead, messages on one or many other topics may be received and read in any order and it is up to the interactants to piece together, the meaning of these non-sequential messages. Students and teachers alike, indicate that this is one of the most difficult components in asynchronous instructional environments.

Thus, one common problem is following the "thread" of an asynchronous discussion that is transacted between many persons over time. Losing the thread of asynchronous discussions can leave students and teachers confused and have harmful effects on students' motivation to learn. This paper will offer strategies and techniques to help ALN teachers and students "keep the thread" of a prolonged, asynchronous discussion.

Discussion

In this section of the paper, we describe the ways in which face-to-face conversational practice works to ensure the shared understanding of all interactions. We also describe how asynchronous interactions may violate these practices and inhibit the construction of shared understanding. Finally, we propose methods for communicating in asynchronous interactions that preserve face-to-face conversational practices and permit students in an ALN to engage in "discursive" learning (Laurillard, 1993).

Face-to-Face Conversations

In synchronous communication, all interactants are aware of (a) the contents of each utterance and action, and (b) the sequence of utterances and actions (Hutchby & Wooffitt, 1998; Mehan, 1980; 1979; Hymes, 1974). Each utterance is a response to its immediate predecessor and the ideas codified in each utterance are indexical (Hutchby & Wooffitt, 1998; Garfinkel, 1967) to the entire sequence of ideas encapsulated in the discussion. As a result of their participation in a discussion, interactants acquire knowledge of it over time, and *while* the interaction is taking place. Entering the discussion "part way through" may leave a person unsure of what is being discussed, and what has been mentioned previously.

However, there are tacit practices that interactants use to repair breaks in understanding or recall, and similar techniques that are used to narrow or alter the focus of a face-to-face interaction (Hutchby & Wooffitt, 1998). These practices and techniques can be used to assist interactants in keeping the thread of an ongoing conversation and even to catch up if it is necessary to refer to an earlier conversation or event, in the current dialog (Hutchby & Wooffitt, 1998).

Keeping the thread in face to face conversations. In face to face interactions, members of a conversation rely on several tacit practices of communication, to maintain a continuity of messages and a mutual understanding of others in the conversation and the topic(s) being discussed: (a) turn taking, (b) repair, (c) overlap, and (d) formulations.

Turn taking is so basic to conversation that it is almost unnoticeable—one person speaks, then another speaks, etc. However, this is so obvious that we might dismiss its necessity. The information embedded in each turn of a conversation is used like bricks and mortar to *build* a scaffold for constructing shared knowledge that is accessible to all interactants. A side effect of turn taking is that each utterance occurs in a relatively rapid sequence. According to the psychological principle of primacy-recency, this implies that interactants are most able to recall the beginning of the conversation, and the most recent utterances—but to forget what was said in between.

If we did indeed forget these "middle" messages, conversations would not be very effective in transmitting quantities of information. Conversational repairs are used to fix troubles in communication. One such repair is to overcome the difficulty in remembering middle messages. This is accomplished through the use of indexical statements that refer back to things that were said earlier in the conversation, or before the present conversation. For example, the following is an example of an indexical reference that prompts the listener to recall something in order to understand the current statement. The ***bolded and italic*** text marks the indexical repair:

A: I'm worried that I don't understand exactly what (the teacher) wants in the project. I might do it in a way that he doesn't like, and.
B: Okay, but ***you also said*** that we can turn in a draft copy and get feedback so we can revise the paper before the deadline.

By repairing the conversation in this way, prior (and perhaps forgotten) utterances are brought back into the discussion so that the interactants remain aware of important topics or subtopics. Thus, even though the psychological principle of primacy-recency forecasts a potential problem, conversational practices have evolved to mitigate and prevent it from actually causing a problem.

In conversations that include more than two persons, the desire to take a turn can be signaled visibly by a movement of the face, head, hands or a shift in posture. A desire to take a turn can also be marked by conversational overlap (Hutchby & Wooffitt, 1998). Overlaps occur when a listener begins speaking before the first speaker is completely finished. Overlaps are not necessarily interruptions. Instead, they may indicate that the listener believes he or she understands the gist of the first speaker's message, and can now begin his or her conversational turn. Additionally, overlaps have the implicit effect of indicating that one is responding to the thing-that-was-being-said-when-the-overlap-started. Thus, and similar to the indexical repair described above, an overlap can also be a signal for what the following statement is referring to. For example, the following is an example of an overlap that serves this purpose. The " | " character indicates the point at which overlap occurs:

A: I'm worried that I don't understand exactly what (the teacher) wants in the project.
I might do it in a way that he doesn't like, and.
|
B: Okay, but you also said that we can turn in a
draft copy and get feedback so we can revise the paper before the deadline.
| |
A. Yeah Yeah

This conversation fragment also illustrates another feature of overlaps. They have a side effect of keeping conversational turns relatively short, thus introducing a smaller number of new ideas. In the example above, speaker "A" terminates his turn shortly after speaker "B" begins the overlap. In terms of the well-known limits to human short-term memory (7 ± 2), this is potentially important because it permits interactants (a) to listen and process the current utterance, while (b) conserving some short-term memory space for remembering prior utterances and (c) using remaining short-term memory space to prepare their response. (It has also been observed, that by preventing a person from overlapping when he or she has understood the gist of a statement can serve to annoy the listener. In instructional conversations, annoyed listeners may *cease to be* listeners, lessening or removing the instructional value.)

Finally, in the course of conversations, individuals actively attempt to understand what is being said in terms of what has been said earlier and what they already know. Listeners are effectively trying to create a new understanding by combining new and old information and knowledge. In order to test this understanding, a person may offer it as a formulation, or a statement that synthesizes current information with what they already know. This formulation can serve several purposes. First, a formulation may be a check for validity—asking the question "this is what I understand, am I correct?" The conversational fragment below, illustrates this kind of formulation. The ***bolded and italic*** text marks the formulation:

> A: ***So you mean that (the teacher) told you that he will accept draft copies of our project, and give us feedback so we can make changes before the deadline?***
> B: That's what he said!

Second, a formulation may act to change the direction of a conversation by repackaging what is being said and adding a new idea. Thus, formulations may be used to verify one's evolving understanding of the conversation, or they may be used to focus or to move the conversational topic. The conversation fragment below illustrates the second type of formulation described above. The ***bolded and italic*** text marks the formulation and refocusing of the conversation:

> A: I'm worried that I don't understand exactly what (the teacher) wants in the project. might do it in a way that he doesn't like, and.
> B: ***Okay, but you also said that we can turn in a draft copy and get feedback so we can revise the paper before the deadline.***
> A: Yeah, yeah
> B: ***But we'll have to start working on it soon, so that we can give him a draft copy. When do you want to get started?***

In both cases, a formulation serves to disclosing the speaker's understanding and keeping other interactants aligned with this understanding. Without formulations, interactants will not be aware of each others' views and understanding and the discussion may erode into one where the interactants are not actually sharing information with each other—but only engaged in several separate monologues that appear to change topics suddenly and unpredictably.

In concert, turn taking, repairs, overlaps, and formulations, and other conversational practices, are used to keep all interactants "aligned" in a discussion, and to permit all parties to construct an understanding over the course of the conversation. The result is not one shared discussion where the group constructs a mutual understanding, but many shared discussions in which all those present are not aware of what others are talking about nor able to take advantage of the distributed knowledge in the group.

Interactions in an ALN

Asynchronous interactions differ from face-to-face interactions in many ways but in terms of topic of this paper, the most important differences are the time lag between each message in a thread, and the loss of many basic conversational practices as described above.

The loss of conversational practice: Turn taking and overlap. Asynchronous classrooms permit many-to-many interactions. The conversational practice of turn taking cannot be easily maintained because there is no way to overlap, or otherwise signal the desire to take a conversational turn. Without the ability (or apparent need) to signal the desire to take a turn, each student can become the "next" speaker in the interaction. The frequent result is that many people may respond to one message, each potentially introducing a slightly different idea that may fragment the discussion into many small pieces. If other students respond to each of these sub-ideas, there is a likelihood that one or more of them will lose coherence with the main topic.

This is not an inherently bad situation because many ideas can be introduced and a wide (if not deep) range of issues can be addressed. However, this situation can easily decompose to the point where sub-discussions spawn even smaller fragments. It becomes increasingly difficult to manage these many sub-discussions. Student and teachers alike can become disoriented and lose sight of the goal of the discussion.

As noted above, one of the benefits of serialized turn taking is that interactants are able to respond to the statements made in the immediately prior turn and, either through overlap or indexical repairs, to indicate *what part of* a prior turn is being responded to. Thus, without the ability to manifest either turn taking, or overlap, with a subsequent loss in serialization of messages, there is a likelihood that each additional response to a message will be more and more difficult to understand.

The loss of conversational practice: Turn taking and indexical repairs. As described above, potentially dangerous side effects of the principle of primacy-recency are mitigated by the reiteration of prior information in a face-to-face conversation. As a result, listeners are reminded of important, but potentially forgotten, information that is necessary to interpret statements that will follow. However, in an asynchronous, many-to-many discussion where turn taking does not exist, the most recent messages read and responded to will be different for each student and each student's "recency" recall will be different.

Additionally, even though individual messages may contain indexical repairs of the kind described here, students can read messages in any order. Also, we have evidence to support the idea that many students do not even read all messages that are delivered to them. With this, there exists a possibility that students may read such an indexical reference before he or she reads the original message it is referring to. In each case, the result can be very disorienting to the reader.

The loss of conversational practice: Turn taking and formulations. Formulations are conversational artifacts that have the effect of "summarising, glossing, or developing the gist of an informant's earlier statements" (Heritage, 1985, p. 100). As described above, a formulation is frequently manifested as a "repackaging" of ideas that have been mentioned in earlier turns. As a result, formulations also rely on the idea that a listener has heard all of these prior ideas in terms of the present discussion. Missing one or two of the component ideas is similar to missing one or two critical pieces in a machine. The machine may not function, and the formulation may not be understood, leaving the learner without important information. As above, the result can be very disorienting.

To summarize this section of the paper, we are arguing that the loss of conversational practice can lead to breakdowns in the discursive instructional potential in an ALN. If left unchecked, such breakdowns can lead to student disorientation, lack of motivation, participation and eventual dropping out of a class.

Keeping the Thread in an ALN

There is a clear need for ALNs presently and in the future. What can be done to help learners to avoid such breakdowns and their potentially damaging effects. To date, there have been several attempts to solve the problems associated with "keeping the thread" using technological solutions.

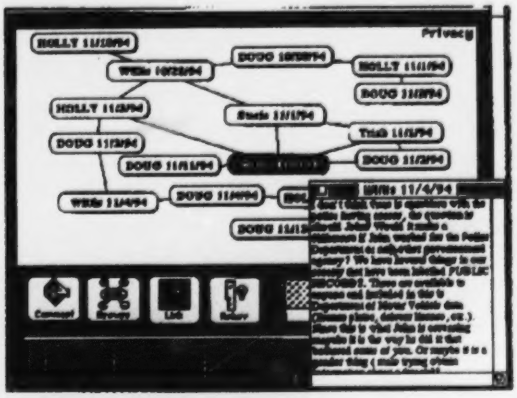
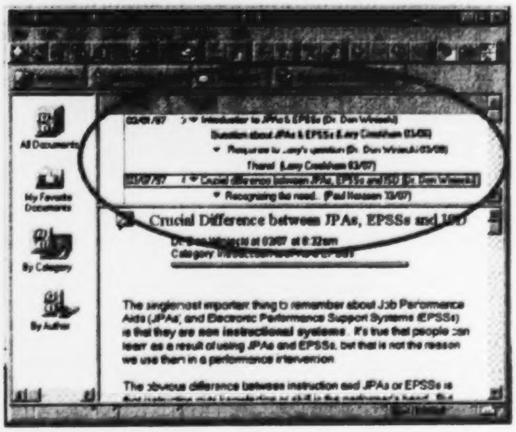


Figure 1: The graphical conversation network.



03/05/97 ▼ Introduction to JPAs & EPSSs (Dr. Don Winiecki)
Question about JPAs & EPSSs (Larry Crookham 03/06)
▼ Response to Larry's question (Dr. Don Winiecki 03/06)
Thanks! (Larry Crookham 03/07)
03/07/97 ▼ Crucial difference between JPAs, EPSSs and ISD (Dr. Don Winiecki)
▼ Recognizing the need.. (Paul Hansen 03/07)

Crucial Difference between JPAs, EPSSs and ISD

Dr. Don Winiecki at 03/07 at 8:32am
Category [illegible]

The singlemost important thing to remember about Job Performance Aids (JPAs) and Electronic Performance Support Systems (EPSSs) is that they are non instructional systems. It's true that people can learn as a result of using JPAs and EPSSs, but that is not the reason we use them in a performance intervention.

The obvious difference between instruction and JPAs or EPSSs is

Figure 2: The threaded topic listing.

For example, one set of solutions proposes that the software system should display a graphical map connecting messages in a "node and network" view (Ahern, 1995) (figure 1). Another set of solutions proposes to represent discussions using structured writing methods such as the threaded topic listing (figure 2). Each of these solutions provide a topical map of the discussion but also requires that one retrace the sequence of messages in the discussion in order to recover the thread. Additionally, these technologies are bound to particular software tools. As a result, in order to use these techniques for keeping track of an ALN discussion, it must be hosted on a software system that includes such features. In other words, the technology of interaction is constrained and even controlled by software features—not by the needs or abilities of the interactants. In contrast to these technological solutions, we propose a reshaping of online communication conduct so that it more closely emulates face-to-face conversational practices. The result is a set of communicative practices that do not rely on any particular set of software features.

Using strategic snipping to simulate conversational overlaps. Among experienced users of E-mail, listserv, and discussion groups, it is relatively common practice to include a short section of the message being responded to, in the message being composed. We call this a "snip." Strategically embedding "snips" in with your message will give readers a reminder of the exact portion of the message you are responding to. When viewed and read as a single message, it reads like a series of short messages. The fragment below represents a message that embeds strategic "snips" of prior messages. Sections that begin with the initials AB are those "snipped" from another student's message. Unmarked paragraphs are those added by the instructor in response to these "snipped" questions.

```
AB>Perhaps I missed it along the way somewhere, but I am not real clear on
  >the meaning of indexical in the context of this JPA. Could you explain
  >what you are thinking about here?

"Indexicality" refers to the notion that any utterance (or sign) is perceived
and interpreted in terms of the environment in which it is said (or seen).
```

Using formulations and indexical repairs to emulate conversational practice. While strategic snipping can indeed assist a reader is retaining the thread of a message, it can only provide exact references to what your message is responding to. If the reader has succumbed to the primacy-recency effect (forgotten necessary components of earlier messages), or has not read enough of the preceding messages to enable them to grasp the embedded information, the reader may still fail to understand your message.

To overcome this potential problem, we have adopted the practice of beginning messages with a formulation that provides a synopsis of "who said what, to who, and when," and how these earlier messages are important to the following comment. The message fragment below represents a formulation that performs this duty. ***Bold and italic*** text marks the formulation. Sections that begin with CD and AB are comments "snipped" from earlier messages

Carl and I are discussing the use of transformational graphics in JPAs. Carl offered that since they are somewhat affective (e.g., not objective), they don't belong in JPAs. I countered and made an example of the Trip and Cal characters on safety signs (mentioned by Tim and Bev).

```
CD>However, I will agree that their use is only called for in special situations, for
  >example when there is not a "direct" way to communicate the desired meaning.
```

```
AB>I'm not sure what you mean by not being able to communicate "directly" would you give
  >an example?

The Trip and Cal characters represent the careless and careful practitioner
(respectively). Because the reader can identify with their overall behavior
patterns, they evoke an image
```

Conclusions

Conversational practice contains many subtle and tacit techniques for allowing interactants to keep track of conversations that transpire over time (Hutchby & Wooffitt, 1998). These techniques can also be used to facilitate instructional interactions to occur in a constructivist and discursive mode (Laurillard, 1993). By their very nature, asynchronous learning networks (ALNs) violate some of these conversational practices and increase the possibility that learners can "lose the thread" of ongoing discussions. We have described several conversational practices that facilitate discursive interaction and how asynchronous discussions fail to follow them. Finally we have provided strategies for reconstituting conversational practice into ALNs, and presented some examples for how they have improved the ability of students to "keep the thread" of asynchronous discussions.

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Techniques for Evaluating Distance Learning Events

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Introduction

The effectiveness of distance learning, when compared to traditional education and training settings, has been demonstrated hundreds of times (Russell, 1996). The studies reported, however, have been largely oriented to college courses, continuing education credits, or professional development training that occur over extended periods and which have "built-in" evaluation measures, such as a final exam. There has been little technical work in developing evaluation measures for short-term training events. This paper describes techniques for creating a simplified form for evaluating the effectiveness of a distance learning event. Here, a distance learning *event* refers to a training or educational program occurring within *one day*. For such abbreviated training the development of comprehensive measures is often not feasible as the brevity of the event precludes the justification for a lengthy evaluation.

The sponsor for this work is the National Guard Bureau, which plans to connect classrooms in 54 states and territories as one distance learning network. While regular courses are being converted to the distance learning format, most of the training conducted during the early stages of the transition was oriented to the abbreviated training event. Thus the need for the specialized evaluation form to verify student learning. Studies of distance learning in the Army have demonstrated positive results. For example, in a study that examined the cost effectiveness of audio teletraining for unit clerks in the National Guard, considerable cost savings over the residence training were documented for the distance learning format (Wisher, et. al., 1997).

Background

Early evaluation studies in distance learning were mostly descriptive case studies that focused on learner satisfaction, and were often anecdotal (OTA, 1989). More recently, there have been discussions regarding what methods are best to use for evaluating distance learning programs. In their review of the evaluation literature, Harrison et. al. (1991) identified three unique components of distance learning that consistently emerged: instruction, management, and logistics (i.e., technology factors, technical qualities, environment, etc.). From this point of view, the sponsor was primarily interested in the instructional effectiveness and technology factors.

As with evaluations of other modes of training, the instructional effectiveness of a distance-learning training event can be measured in terms of student reaction, learning, behavioral criteria, or results criteria. Each measure is used to assess different aspects of the value of an event. Some are objective and some are subjective, and each has advantages and disadvantages in terms of preparation of instruments, administration time, and decisiveness of results.

An evaluation based on student reactions measures how favorably the participants respond to a training event, including its contents and delivery, relevance to their job, the training technologies used, and the overall training environment. Favorable reactions to training events do not guarantee that learning has taken place, but they are useful to collect for several reasons. First, positive reactions help gain or maintain organizational support for training events while negative reactions can lead to problems of future support. The second benefit is that reaction measures can serve as a source of immediate feedback to the training providers, including instructors, production staff, and training event organizers. Such data can prove helpful in planning and designing future training events. A third benefit, not necessarily unique to reaction measures, is subgroup analysis, through cross tabulation. Such an analysis can further elucidate the relative impact of the training across subgroups, such as military rank.

Another type of reaction measure, obviously subjective, is the self-assessment variable. This technique requires that respondents evaluate themselves on various dimensions of the training, such as how much more they learned compared to what they already knew about the topic. The self-assessment variable may be viewed as a bridge between a reaction measure and a learning measure, as it assesses learning directly, but in a subjective way. Regardless of the context, most of the research in this area has identified significant correlations between self-assessments of ability to perform tasks and performance measures (either knowledge tests or supervisor assessment).

In contrast to the subjective nature of reaction measures, learning criteria offer an objective means to assess the knowledge and skills acquired during the training program. Although learning criteria are a stronger, more decisive measure, one drawback concerns the time to develop test instruments and the costs of their administration—the evaluation resources. Tests specific to the knowledge taught need to be developed, pre-tested, and administered. A learning measure usually requires additional development effort which might be impractical for a short-term event. The use of self-assessment as a surrogate learning measure, although subjective, might remedy this issue.

Development of the Compressed Evaluation Form

In the context of distance learning training events for the National Guard Bureau, the reaction and learning measures were most relevant due to the need for quick feedback to event organizers and sponsors as well as to monitor whether the training objectives of the events are being met. One of the practical considerations was the effort required for the development of a knowledge or performance test for the learning measure. In view of the limited resources for instrument development and the range of anticipated training events, a strategy to have a self-assessment scale serve as the learning measure was selected. This set the stage for a compressed evaluation form to be created and the subsequent evaluation time to be brief, since a lengthy knowledge test would not be included. More importantly, it provided an acceptable source of data for the types of analyses relevant to the Bureau's interests, mainly the instructional and technology factors: How well did the technology work and did the soldiers learn from the training experience?

Recommendations from the literature on length, saliency, confidentiality and anonymity, and ease of return were factored into the design of the evaluation form. Additional suggestions were gained from other evaluators in the distance learning field. A review of instruments from educational institutions and government agencies, most published in the open literature but some made available through personal communications, resulted in the creation of a set of comparative variables: number of pages for an instrument, number of assessment categories (such as demographic, instructor, facilities etc.), number of questions within each category, and a description of the scales used. The results of this analysis showed the following: the length of the evaluation instrument ranged from 1 to 5 pages with an average of 37 items covering five assessment categories and using categorical and 5-point Likert scales. Based on this analysis and the Bureau's requirement ("did the technology work and did soldier's learn?"), the evaluation form was compressed into a single page of five assessment categories (course, technology, instructor, demographics, and motivation) with a total of 22 items. The demographic variables were needed to detail a more refined look at learning patterns that might emerge from a cross tabulation of the data. The goals of a short form with a confidentiality statement, salient to-the-point items, and a pre-paid return envelope provided to each site were accomplished.

Test of the Compressed Evaluation Form

Eight distance learning events were sampled. These events represented the primary distance learning events available on a nation-wide basis during the evaluation timeframe. All training was delivered through a multi-point, one-way video two-way audio connection through satellite links. Examples of the training events were Risk Management (three iterations), Airborne Call For Fire, and Terrorism Update. A total of 1,306 soldiers participated in the training. The number of remote sites per event ranged from 3 to 32, with up to 63 students per site. Site facilitators returned attendance lists to an event coordinator, allowing return rates to be computed. The percentage of returned evaluation forms ranged from 30% to 97%, with a mean return rate of 74%.

Nine questions addressed technology factors, the course, the instructor, and the learning environment. Each question asked respondents to rate an aspect of the event using a five-point scale from "poor" (1) to "excellent" (5). The means and standard deviations for each appear in Table 1. Also presented are means from substantially similar questions reported in studies of distance learning conducted by the Navy (Wetzel et .al., 1996). These provide a benchmark comparison for the ratings obtained in the present study. By and large the students reacted favorably to the experience in agreement with the Navy study. The lowest mean ratings occurred for "opportunity to ask questions" and "quality of audio" and the highest ratings were for "location of video" and "quality of video."

A self-assessment measure was used as a surrogate for a learning measure. The form of self-assessment in the current report stems from the question "Compared to what you already knew about *'course topic,'* how much more did you learn in this training event?" Since resources for the evaluation were limited and the variety of training events was considerable, the development of more decisive measures of learning was not practical, nor were they already available from end-of-course tests.

Table 1. Means and Standard Deviations for Student Ratings of Events

		National Guard Events		
Question	Navy Benchmark	*M*	*SD*	*n*
Location of the video screen	4.6	4.4	.81	1031
Quality of audio	4.1	3.8	1.21	1023
Quality of video	4.5	4.2	.96	1025
Instructor effectiveness	—	3.9	.91	960
Opportunity to ask questions	—	3.7	1.22	903
Responsiveness to student questions	4.5	3.9	1.00	849
Relevance of course to guard duties	4.3	4.1	.96	938
Overall learning environment	—	4.0	.99	1005
Overall effectiveness of instruction	—	3.8	.98	1000

Cross Tabulations

Overall, 58% of the respondents reported previous training in the topic being covered. Of particular interest were the interrelationship between two variables, the self-assessment of perceived learning and whether or not the respondent had previous training on the topic. This interrelationship was examined by using cross-tabulation, resulting in Table 2. Note that on the five point scale, ratings of 1 or 2 were netted as "little" was learned, a rating of 3 was interpreted as "some" was learned, and a rating of 4 or 5 was netted as "a lot" was learned. In all cases, the ratings were made relative to whether the respondents had previous training on the topic.

Table 2. Percentage of Responses for the Cross Tabulation of Amount Learned by Previous Training

	No Previous Course			Previous Course			
	Amount Learned			Amount Learned			
	Little	Some	A lot	Little	Some	A lot	*n*
Overall (all 8 courses)	12%	32%	56%	26%	43%	32%	1,044
Risk Mgt. Course							
Iteration 1	6%	32%	62%	22%	46%	32%	227
Iteration 2	13%	35%	52%	17%	50%	33%	88
Iteration 3	13%	27%	60%	28%	41%	31%	234

Table 2 shows a pattern in which those who had not taken a previous course in the topic area reported greater amounts of learning. Overall, more than half (56%) of those with no previous course reported learning "a lot." However, for those reporting having taken a previous course (and thus possessing prior knowledge) only 32% reported learning "a lot." While the majority of respondents reported learning "some or a lot," it appears that the courses were generally geared to those individuals who had no previous training in the topic area. In comparison, many more of the respondents (26% vs. 12%) who had previous training learned "little," indicating that a more advanced course may have been more appropriate for them. This supports the face validity of the self-assessment technique.

As the Risk Management course was evaluated on three separate occasions, it presented the best opportunity to explore the consistency of the relationship between the two key learning variables. As can be seen in Figure 2, the patterns between the three courses were quite similar. Face validity was examined by comparing perceived learning between subgroups who either had or did not have a previous course on the topic. Analyses showed significant differences in self-assessed learning between those who had taken a previous course and those who had not ($F(1,476) = 28.16$, $p < .001$). To gauge the external reliability of the previous course experience variable and the self-assessed learning variable, a 2 X 3 ANOVA was conducted, with two levels of previous course experience and three levels of learning. This analysis revealed no significant mean differences of self-assessed learning among the three events ($F(2, 476) = .38$, $p = .684$). The ANOVA results indicate that the amount of perceived learning was consistent across all three events. Furthermore, there were consistent differences in perceived learning between those who had and had not taken a previous course in Risk Management.

Conclusions

A useful strategy for evaluating single-day distance learning events is the use of a compressed, one-page evaluation form that is designed with consideration of confidentiality, saliency, convenience of return, and length. The research literature has demonstrated these factors to be of value in obtaining higher return rates. Another aspect of the literature that was useful was the self-assessment variable for evaluating learning. Even though this variable has had some controversy in the past, its use in a military training setting (especially when coupled with anonymity) appears not to have the same problems that have troubled other applications. The obvious advantage in the self-assessment approach is a great savings in administration time, not to mention the avoidance of having to develop a separate learning evaluation instrument.

The findings and analyses reported above demonstrate the wealth of informative data that can be obtained from a simple, one-page evaluation form. There are many other cross-tabulations and analyses that could be conducted, depending on the interests of the organizations, to pinpoint technical shortfalls, course effectiveness, learning, and certain policy issues. Although the compressed form is only one page in length, the opportunities to cross tabulate on the basis of demographic factors can lead to important insights and trends. Such analyses can provide useful feedback to the stakeholders in distance learning, including organizers, managers, instructors, and technicians.

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Autobiographical Sketches

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Putting Interaction Into Interactive Television

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Abstract

Current technology provides many new ideas and alternatives to traditional education and training practices. From the experience of the USAF Academic Instructor School (The Teachers' College of the Air Force) and current research in the field, teaching via interactive television (teleseminar/video teletraining) requires new teaching skills and new ways of thinking about the classroom. This paper will briefly identify and discuss some the instructor skills which have been identified by the Academic Instructor School as critical to the success of its Interactive Television (ITV) educational or training broadcasts.

Introduction

> *"The key to success in distance learning is the teacher. If the teacher on the system is good, the technology can become almost transparent. No technology can overcome poor teaching which is almost exacerbated in distance learning application."*
>
> —Congress of the United States
> Office of Technology Assessment

In the late 1980's, the Office of Technology Assessment (OTA) was tasked by the Senate Committee on Labor and Human Resources, under the auspices of the House Committee on Education and Labor, to do an in-depth study of distance learning. As a part of this study, OTA analyzed various technological options, examined current developments, and looked at their effectiveness from a variety of perspectives. The result of this major tasking was the publication in November 1989 of a report, *Linking for Learning; A New Course for Education*. Along with numerous examples of a wide variety of highly successful distance learning programs in all levels of education, a frequent theme found in the report is the importance of a faculty well trained in the application of today's technology.

From the experience of the Academic Instructor School and supported by continuing research, it appears that teaching by television requires unique skills that go beyond traditional classroom teaching methods and styles. This paper/presentation will look at the AIS experience and some of its early findings.

Putting Interaction Into Interactive Television

Defining Distance Learning

Throughout the literature for distance learning there are many definitions and discussions within the field as to how it should be defined. The USAF has adopted a definition that was developed and used at a distance learning conference held in Los Alamos, New Mexico in October 1989. This conference was attended by a wide range of educators, members of the military, representatives from the Department of Defense as well as representatives from industry. The definition agreed upon was: "Distance learning is structured learning that takes place without the physical presence of the instructor."

By this definition almost everyone has been involved in distance learning of various types for much of their life. The military has been using correspondence courses for years; which are, in fact by this definition, a form distance learning. Much of the training provided to the military during World War II was through films and correspondence. Records show that correspondence courses have been used in America to teach others as early as the late 1700s. Many of us learn extensively from commercial television. The Public Broadcasting System (PBS) is recognized by many as an educational channel. The Mind Extension University (MEU) was developed specifically to provide learning via distance through television. Other commercial television channels, such as The Discovery Channel and The Arts and Entertainment Network, just to name a few, have taught us very successfully via distance learning for a number of years. The point is that distance learning is *not* new and most of us have been exposed to it. Currently, distance learning educational programs from grade school through college level masters degree programs are flourishing very effectively throughout hundreds of institutions in our country. These programs include a wide range of distance learning media from traditional paper-based courses through interactive computer courses, including multimedia CD-ROM, and a variety of interactive television technologies.

At this point, it is critical for potential instructors to recognize that distance learning is not new but an expansion of an old idea, using new technology. Along with using this new technology comes the requirements for new skills that must be learned to be effective. The idea of the effectiveness of distance learning can also be shown by drawing on the wealth of research available which identifies effective programs throughout industry, DoD, and educational institutions from around the country. A prime source to start with is the Office of Technology Report, *Linking for Learning*, or the National Technology University, a nonprofit institution which offers undergraduate and graduate level courses taught by the faculty of over 40 major leading universities throughout the United States. A few examples of distance learning in industry might be the extremely successful program offered by Ford Motor company to their employees through an agreement with Wayne State University in Michigan, or the model distance training program implemented by the Prudential Insurance Company. In order for potential instructors to be effective they must be convinced of the viability of the medium.

The Affective Component of Distance Learning

In any classroom situation there is a strong relationship between attitudes and behaviors displayed by an instructor and attitudes and classroom behaviors of students. Since the late 1950s, a group of educational psychologists have said that we learn through three primary areas, or domains: the cognitive or thinking and intellectual processes; the psychomotor, or by doing; and the affective, or our feelings and attitudes. The last educational hour in all of the AIS courses is called, "The Requisites of a Competent Instructor." During this hour, students are asked to reflect on all the educators or teachers they have had and to remember one or more of those who stand out as "the best teacher I had," and find an adjective they would use to describe that teacher's most outstanding quality. Having done this for over nine years at AIS, involving over 900 individual students, I have compiled a list of 33 terms that have most often been identified. Inevitably, 80 percent of the terms identified by students are either purely affective, (reflect a positive instructor attitude), or strongly affective with a slight cognitive (intellectual) component (*). Below is a listing of the 15 most common terms and the general order in which they are identified with the primarily cognitive terms identified. Rarely does "content knowledge" or "communication skills," which are primarily cognitive, appear in the first items identified by students. My results are consistent with the results of other AIS faculty members for this exercise.

Sincere
Enthusiastic
* Effective Communicator
Care & Concern
* Content Knowledge
Sense of Humor
Flexible
Professional
Objective
Approachable
Prepared
Dedicated
Good Listener
Confident
Friendly

What this would appear to indicate very strongly is that most students apparently look for a number of portrayed attitudes by instructors that are at least as important, if not more important, than just content expertise. (These results do not in any way dismiss the instructor need for content knowledge and expertise.) One of the strong arguments as to why distance learning cannot be effective is the lack of observable one-on-one student-teacher classroom relationships that are established, plus the inability to observe student nonverbal cues. Although some of those things are not available via television, there are a number of affective or attitudinal behaviors that can be portrayed through the medium that will encourage and aid in the student affective component of the learning process. In order for instructor/student or student/student interaction to be effective, the instructor needs to be aware of and develop those skills that create that positive affective atmosphere.

This brings up another consideration that is directly related to the affective component of learning, that is the selection of the instructor for distance learning delivery via interactive television. Not all teachers want to or can deliver lessons via television. It might be a real case of stage fright (camera shy), a personality issue, or a person who just cannot make the adjustment to some of the limitations teleteaching imposes. The current literature cites cases where institutions have conducted faculty screen tests or auditions before making their selection for distance learning instructors. The Air National Guard Professional Military Education Center in Knoxville, Tennessee, is currently delivering one of their Enlisted Military Education Courses via distance learning. As part of their early planning and preparation, they had their faculty members go through a screen test to aid in deciding who the distance learning instructors would be. The role the affective component plays in distance learning instructor skills cannot be over emphasized.

Many of us have experienced the traditional classroom in which the instructor teaches by a relatively formal lecture and with little or no student interaction. In these settings many of us, even when interested, have found it difficult to enjoy and be a part of the learning process. Imagine that same scenario as we sit miles away from the instructor while watching a TV set and listening to a "talking head." Maintaining student interest becomes an even more difficult challenge in distance learning than in the live classroom setting. Have you noticed how much variety, changes in camera angles, and use of video clips are involved in a nightly network newscast? Much of this is done to maintain viewer interest. In most major network broadcasts there is some sort of action or change every 10-to-15 seconds.

Maintaining student interest obviously creates a real challenge for the interactive television instructor. As we worked with instructors, we put a great deal of emphasis on improving their ability to ask frequent, in-depth questions and foster interactive discussions within the distance classroom. If the distance learning model is only to provide a formal lecture, then making a videotape and sending it to the students is much more cost effective and serves the same purpose. AIS faculty have been successful in presenting a variety of teaching methods via interactive television for distance learning. Some of the methods which have been taught successfully are: Teaching Interview, Case Study, Group Discussion, as well as extended Informal Lecture. The key to the success of these various methods has been the instructor's extensive knowledge and understanding of the affective component of interactive television as well as a highly developed skill in utilizing effective questioning and student probing techniques. Variety, interaction, and involvement are directly related to the affective component of the learning process. Also critical are communication skills.

Communication Skills

Certainly, in any classroom environment the instructor's communication skills are important. However, as rapport is established individually and collectively with a live class, there are often some minor things that happen during the lesson that can be overlooked or joked about. However, distance learning students are usually far more critical and television is far less forgiving of even small mistakes.

Clarity of speech and enunciation are far more important in a distant learning scenario than in a live classroom. During a resident class the instructor's voice may tail off at times but it is still audible in the classroom and the students will adjust and frequently accept it. However, when broadcasting this becomes far more pronounced and the students may find it very distracting. Also, related to this are verbal pauses that may be an unconscious habit of an instructor and overlooked in a live classroom. Such things as: *uh, um, you know, o.k.*, and other unconscious sounds easily become major distractors via television. Grammar and vocabulary are other critical elements when broadcasting that are not as critical in the live classroom. That is not to say these things aren't important in a residence course but they do become magnified for distance learning students. In addition to variety, interaction, and involvement, which we previously talked about, improved questioning skills and techniques are critical in the distance learning environment. It is important to ask clear questions that require substance and thought when students respond. One of the most difficult tasks for any instructor to learn is to allow silence to occur after asking a question. In our culture it appears that silence during a conversation is threatening and we feel a need to fill this void. Instructors must learn to wait and allow students time to hear the question, interpret it, formulate an answer, and be willing to provide that answer to a television monitor. If the instructor continually jumps in with the answer, the students will come to expect that and not make any effort to respond. These concerns are just a few of the issues surrounding effective verbal communication skills needed in an effective distance learning environment.

Non-verbal communication takes on an even more significant meaning as it relates to interaction and interactive television. Probably the most important of all of the non-verbal behaviors is eye contact. It is important for instructors to learn to talk *with* the camera and maintain direct eye contact. This is the most important connection between the presenter and the distance students. Whether presenting from a live classroom or a studio there are many distractors that make it easy for a presenter to forget and to ignore the camera. On occasion, presenters have found that putting such things as a wig or a favorite teddy bear on top of the camera has helped their focus in this crucial area. Facial expressions of the presenter are very clear to the distance students and any looks of disdain or disgust when responding to a student's question or reply are magnified and quickly impact on the presenter's rapport and credibility. However, a smile or facial expression of interest or concern go a long way in maintaining student interest.

As mentioned earlier, movement of the instructor is an important part of non-verbal communication. Excessive movement is also a distractor when using television.

Although the director is responsible for the camera angles and shots, the presenter must be aware of limitations when working with television. Gestures are magnified, wiping the face (particularly around the nose) is greatly exaggerated and sends a distracting message to the distance students. Hand gestures frequently used in a normal classroom setting may need to be modified on camera. Pushing one's eyeglasses up with the middle finger may be an incidental unconscious habit of convenience, but during a close-up camera shot it may take on a whole new negative connotation. One final concern of communication is the presenter's listening skills. All too often we hear what we want to hear and spend little time developing active listening skills. With a wide range of distractions, whether in a live classroom or a studio setting, unless a conscious effort is made to listen attentively it is easy to miss or misunderstand a student response or question. Students expect us to be as attentive to them as we want them to be to us. This is particularly true in distance learning and requires extra effort on the part of the instructor. For many, becoming consciously aware of the impact our overall communication skills have on the distance learning classroom may be difficult because of our long-term habits as instructors.

Conclusions

The current distance learning research strongly supports the effectiveness of interactive television as a medium for distance learning. At the same time, it also indicates that the role and skills of the instructor are critical to that effectiveness. Delivering distance learning via interactive television does not just happen and is not the same as teaching in the traditional resident classroom. Although educators have long been aware of the importance of the affective domain in the classroom, it appears to take on an even more crucial role in successful distance learning. Being aware of and understanding the components of the affective domain as it impacts interactive television is crucial to the successful distance learning instructor. Putting interaction into interactive television doesn't just happen but must be understood and planned for by the successful teleseminar instructor. *"No technology can overcome poor teaching which is almost exacerbated in distance learning application."*

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Autobiographical Sketch

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❖ Workshops ❖

Creating a Virtual Learning Environment With Groupware

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Groupware and Virtual Learning Environments

Groupware offers course designers the capability of developing flexible, secure, and interactive learning activities. Groupware is becoming a preferred option for course and program designers who wish to incorporate the security and flexibility of an Intranet with the reach of the Internet. The number of groupware learning applications within higher educational institutions is growing quickly. The College of Information Science and Technology at Drexel University in Philadelphia has been using groupware for three years. The University of Texas has been using groupware for some of its business programs for the same length of time. Athabasca University in Canada offers an MBA using groupware. Established in 1993, the program has admitted more than 500 students across Canada, all of whom are networked with groupware. There are another 900 students studying undergraduate courses at Athabasca University using the Virtual Teaching and Learning (ViTAL) environment, developed using groupware. Information on ViTAL is available at the Athabasca University web site: http://vital.athabascau.ca.

The presenters have developed expertise in implementing such activities for more than 30 university-level distance education courses, which now attract some 1,000 students at Athabasca University. This workshop will provide participants with the opportunity to see how learning activities can be planned, developed, and implemented using groupware. The workshop will provide an overview of the capabilities of a leading groupware package, Lotus Notes. Participants in the workshop will learn to do the following:

- Carry out basic activities using the main features of a popular groupware package.
- Demonstrate an understanding of the basic learning interactions that can be designed using groupware.
- Design the processes and structures (the "back office") required to manage the interactions of students within an electronic environment.

The learning activities to be covered in the workshop are a conference, an assignment preparation and submission area, and a study guide. These activities, when completed, will form a basic virtual learning environment, which participants may wish to develop further after the workshop. The virtual learning environments being created with groupware represent a breadth of learning resources not to be found in more conventional distance education: library access, frequently asked questions, electronic study guides, conferences, news areas, and so on.

This workshop will provide participants with the opportunity to see how learning activities can be planned, developed, and implemented using groupware. It will go beyond this to discuss the "back-office" facilities that need to be developed in order to ensure that student inquiries and learning interactions are managed effectively. As educators begin to use the Web to design learning opportunities for their students, they must also consider the design of their systems for managing the significant flow of information that accompanies these learning activities. The emphasis will be on using groupware to create an electronic learning environment in which students have access to many sources of information and support, with the faculty member becoming part of a team of educators and information managers. The discussion in this part of the workshop will focus on the need to design for appropriate management of the learning environment.

The Basic Features of Lotus Notes

Before moving to the design of a virtual learning environment, some basic features of Lotus Notes are covered. Groupware allows for decentralized design and management of the learning environment. This means that each member of the teaching team should understand the basic use of the software. For example, professors would not normally be involved in directly developing learning activities, although they would provide the academic framework for the creation of all learning activities. Even so, they should be able to add or change topics within their conference activity without extensive assistance from technical staff. The basic features to be covered are the following: virtual tabs and pull-down menus, icons, forms, fields, views, and navigators

Virtual Tabs and Pull-Down Menus

Virtual tabs allow you to organize your workspace. When you click on a tab it opens up a new workspace page. You can change the color on the tabs and the titles. In a virtual learning environment, each tab may be used to organize the activities in a course. Pull-down menus can be designed for each learning activity. These menus allow students to create documents such as assignments or discussion contributions.

Icons

Notes databases (learning activities in the virtual learning environment) appear as icons for students. Students double-click on an icon to open a learning activity. Designers of virtual learning environment can create a distinctive icon for each learning activity or a common icon for activities within a course.

Forms

Forms are the pages students use to carry out learning activities in the virtual learning environment. Lotus Notes provides template forms that designers of the virtual learning environment can use. For example, forms for creating a discussion are provided, which designers can change to reflect the title of the learning activity and course. Forms can contain text (with boldface, italics, rules, and other text features), fields (for students to enter responses to answers, for example), graphics (such as illustrations or photos), and buttons (to open a simulation, for example) or other objects.

Fields

For some fields, data is filled in automatically. These fields are called computed fields. For example, a field in a discussion response form might enter the student's name and the topic automatically. Other fields can allow students to enter text or rich (formatted) text. Still other fields contain keywords, which students can select. These might be used in a course-evaluation form in which students are asked to rate (by choosing a word from a field) the various parts of the course.

Views

Views allow students the convenience of looking at documents in rows or columns. Designers of virtual learning environments should consider the different ways that students may want to view information within learning activities. For example, the views in a conference or discussion may allow students to browse contributions by student name, by topic, or by date.

Navigators

A navigator helps to create a more user-friendly environment. Navigators allow students to find documents or initiate actions without having to maneuver through menu commands. For example, to develop an assignment a student might have to choose items from three or four menus. A navigator would allow the assignment form to be created at the touch of a button. You can add custom navigators by copying a navigator from the same learning activity, copying a navigator from another learning activity, or creating a navigator from scratch.

Creating a Conference

Conferencing is an important area within the virtual learning environment because of its implications for student interaction. Conferencing allows students to step from the isolation of independent study to the interaction of a discussion. For faculty, the conference should provide a flexible framework for discussion, in which topics can be changed or added as needed. The steps to creating a conference are the following: making a new copy of a conference activity from a template; editing the forms in the new conference; customizing the fields that students will use when contributing to the conference; and editing a help document for the conference.

Making a New Copy of a Conference Activity From a Template

A template for a conference activity should be developed or purchased in a way that ensures that the characteristics of the student, faculty, and course content are reflected in the design of the conference. (A conference template or template for other learning activities may be available from another learning institution. The presenters can provide more information.) For example, a conference in a graduate-level university course might have pre-selected topics, which students then respond to, with comment and advice from faculty as needed. For such a conference, students could respond freely to the topics given but would not be able to create a new topic. A conference in another course might allow students to create topics and discuss them in a more freewheeling environment.

By creating a copy of the template a new version of the conference is created, one that has a unique identification number and which will be updated separately from the template and from other conferences. The access that different groups of people have (faculty, students, smaller study groups of students, support staff, and so on) is set at this stage.

Editing the Forms in the New Conference

A new title for the conference should be created. The title should reflect the subject area of the course or discussion. Some ideas are "Writing Roundtable," "Workshop on Business Strategy," and "Marketing Case Discussion." The forms to be used in the conference need to be customized to reflect the conference title. As well, the conference "discussion starters," if any, are entered on the appropriate form.

A conference may have three or more forms, such as the discussion starter, the response to the discussion starter, and the response to response. Each of these needs to be edited carefully and tested.

Customizing Fields

The template conference activity may provide the fields that students need for participating in the conference. However, these fields should be checked and customized if appropriate. If, for example, it is expected that students will attach documents, videoclips, spreadsheets, or other items, the field must be able to accept such attachments.

Similarly, the heading fields should be checked. A field in the heading may show the contributor's name automatically, with another field instantly showing the topic to which s/he has responded. This may be appropriate for some conferences, but for others the contributor's name might be optional.

Editing a Help Document for the Conference

As with the other learning activities, it is important to ensure that students have help documents at hand. Using the help documents that were provided in the template, check and revise the help documents, adding links to other sources of help as appropriate.

Creating an Assignment Area

The assignment activity can be one of the most attractive features of a virtual environment for students. It allows students to use their computers to draft, revise, and submit assignments. It can also provide information and advice about assignments. Productivity and marking turnaround time are improved for the students. In our experience with the virtual learning environment, student assessments show that students value this improvement highly. The following steps can be followed for creating an area in which students can draft, revise, and submit assignments: customizing a pull-down menu; providing instructions and help information; adding a rich-text field; and specifying the assignment routing

Customizing a Pull-Down Menu

The pull-down menu provides the list of assignments from which students choose the assignment they will prepare and submit. The menu should be customized from the assignment template. In addition to the assignments to be included in the menu, support documents for the assignments should also be added here. Support documents may include information on how and when to submit the assignments. They may also provide a sample assignment for the student, with grading completed.

Providing Instructions and Help Information

For each assignment, the instructions for completing the assignment should be drafted, edited, and tested. Any information that can help the student complete the process of attaching or entering text in the form should also be included, especially for the first assignment in a course or for students using the virtual environment for the first time.

Adding a Rich-Text Field

Some assignments may require the student to attach an essay that has been prepared using a word-processing package. For such an assignment, the field must accept attachments. Alternately, the student may be asked to enter text directly into the field in response to questions provided on the form. Here, a rich-text field will allow the student to add graphical features such as boldface, italics, text centering, and so on.

Specifying the Assignment Routing

After the student has completed and closed the assignment, the form will be sent for marking. The designers of the virtual learning environment should decide where the assignment should be routed, whether directly to a marker or to the front-line support staff, who would then document the receipt of the assignment and forward for marking. A computed field is used to route the assignment appropriately.

Designing for Management of the Virtual Learning Environment

In the Athabasca University systems for graduate and undergraduate business courses, the groupware computer platform is managed around one entry-point for students. In the MBA the single entry-point is staffed by customer service representatives. In the undergraduate area, with its greater volumes of students, the front-line staff are designated as Call Centre facilitators. In both systems these individuals decide what items to refer to other experts and what they themselves will deal with.

The MBA is entirely electronic. In the undergraduate area of studies the Call Centre is the focal point for both the online students and those who are studying with traditional paper-based course packages. Here, groupware is used to manage all student contact even though only a portion of these students are involved in on-line study.

The Call Centre takes a one-entry-point approach to service delivery, allowing students to telephone or e-mail inquiries over a range of disciplines within the business and administration areas. Courses include accounting, administration, communications, computer management and information systems, management science, and organizational behaviour. The Call Centre handles approximately 40 courses with about 3,000 student enrollments at any given time. Five learning facilitators provide service to students six days per week, including daytime and evening hours.

Learning facilitators are members of the teaching team, along with professors, tutors, and markers. A learning facilitator responds to student requests immediately on topics concerning examination procedures, study strategies, administrative matters, technical issues about software installation and operation, and common problems regarding the academic content of the courses. Responses to academic queries are made based on consultation with electronic databases developed in Lotus Notes. These databases are created and revised by learning facilitators and professors.

An important part of the learning facilitators' network of information is the Callback Conference. When a student calls or e-mails the Call Centre, the learning facilitator attempts to resolve the inquiry immediately. If s/he cannot resolve the inquiry immediately, an entry is made in the Callback Conference using Lotus Notes. The nature of the inquiry is recorded, along with the student's contact information and, if appropriate, the hours when the student is available for a callback. The professor of the course checks for Callback Conference items each day, responding by telephone or e-mail within two working days of the student's inquiry. The Callback Conference is then marked as resolved. If an item stays unresolved for more than two days, a warning icon (a thermometer getting "hot") appears, alerting learning facilitators and professors to an area of service concern. All professors and all learning facilitators have access to all inquiries entered into the Callback Conference, contributing to a culture in which service delivery is considered a team responsibility and in which service concerns are dealt with openly and efficiently.

Autobiographical Sketches

Marco Adria is an Assistant Professor of Communication Studies at the Centre for Commerce and Administrative Studies, Open Business School, Athabasca University. He was a co-developer of Athabasca University's electronic MBA. He is currently coordinating the development of the University's undergraduate electronic Bachelor of Commerce degree using Lotus Notes. He interacts daily with students using the University's Virtual Teaching and Learning (ViTAL), a groupware application. He teaches two courses in organizational studies that have been developed using Lotus Notes.

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Connecting With Distance Students: Interaction and Merging Technologies

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Introduction

Most teachers, college faculty, and trainers acknowledge that one of their greatest pleasures in teaching is the relationship they are able to develop with their students/learners and the interaction they are able to achieve with them as they learn together. It is one of the reasons they chose their profession in the first place and it is one of the primary motivators in their current work. Whether the interaction is largely accomplished during live classes or through informal dialogue with students outside of class, most faculty/trainers agree that it is a rewarding aspect of teaching. It is also one of their primary concerns as they anticipate teaching via interactive television for the first time. On the surface, it appears to them that engaging students in this way will be more of a challenge on ITV than it is in the traditional classroom environment.

Similarly, a large number of learners claim that the relationship they form with their teachers/trainers is a major part of a meaningful learning experience. Even students who feel less of a personal need for interaction in live classes often find they want contact with fellow learners or the instructor when taking classes at a distance. In fact, many students feel that communication with the instructor is the most valued part of distance learning (Holmberg, 1989). Fortunately, recent advances in instructional television technology and falling prices have made *interactive* television much more widely available throughout the country. Many of the shortcomings of non-interactive educational television used in the 50's and 60's have been technically overcome. The challenge is to learn how to take advantage of the technical capabilities that can facilitate meaningful interaction.

The purpose of this paper is to acknowledge this challenge and explore a host of instructional strategies that can be used to promote interaction in the ITV environment. Of concern to many faculty/trainers new to teaching at a distance is how to adapt what they usually do effectively to fit the ITV environment. We will explore how to adapt effective, traditional instruction to ITV, how to capitalize on the opportunities that ITV affords the instructor, and how to employ supporting technologies to extend the interactive community beyond the live class time.

Adapting Instructional Strategies to ITV

As in traditional instruction, students quickly learn what the instructor expects in the way of interaction. Either through formal orientation or through indirect modeling, the instructor establishes how students are expected to interact (e.g., is it acceptable to interrupt? can they talk with one another or only with the instructor?), when interaction is encouraged (e.g., any time? during designated discussion periods only?), and under what circumstances or on what topics it is expected (e.g., clarification on assignments? class content topics only? questions about the readings?). These rules of thumb are unique to each class and are usually established very early in the semester or training sequence. For most faculty/trainers, a climate that is conducive to student participation requires planning and practice (Galbraith, 1990; Knox, 1986; Zvacek, 1991). The interactive television environment, likewise, demands a more intentional plan at first until the unique aspects of its venue become more familiar to the new distance instructor. The specific format selected by the instructor can vary widely, however; no single instructional approach is best. More important is that each instructor select a combination of instructional strategies that fits his/her content and effective teaching style best. The key is adapting effective instructional strategies to fit the new opportunities and limitations of the specific technology being employed.

Distance teaching that promotes interaction, for example, includes nonverbal immediacy behaviors such as smiling, positive facial expressions, humor, "I'm interested in hearing what you have to say" body language such as leaning forward and tilting one's head slightly while listening (Anderson, 1986; Baker, 1994). It also includes the use of language to solicit feedback from the students, question them and verbally encourage their participation (Knox, 1986; Galbraith, 1990), and the use of verbal immediacy behaviors such as using student names, showing interest in student ideas, rewarding them for contributing in general, and using personal examples or ones relevant to the students (Baker, 1994). Most of the these instructional strategies are not unique to distance teaching, but rather techniques used by instructors in most any instructional environment to promote student participation. New instructors to distance teaching, however, often find these behaviors require more planning and intentional effort because the non-verbal body language of the students at the remote sites are not visible at all (e.g., satellite) or not easy to see (e.g., compressed video, microwave), and therefore, cannot be used to stimulate instructor behavior as they are often used in traditional instruction (Baker, 1994).

Additional strategies are even more important in interactive television instruction. For example, effective instructors acknowledge learning student voices is valuable and not very difficult to accomplish. It makes it possible to refer to the students by name or switch manually to the student's site (depending on the technology involved) when the voice is recognized, letting the student know indirectly that the instructor knows and cares who they are (Baker, 1994). Personalizing instruction also promotes interaction. Techniques used by successful instructors include such things as getting-acquainted activities, teaching at least one class from each remote site, and using verbal methods to solicit feedback from the students. These latter events allow the instructor to get to know the students better, and the students appear to participate in class better following such visits and activities (Baker, 1994). Since nonverbal feedback is either nonexistent or difficult to collect, verbally asking for feedback is critical (Baker, 1994).

Managing the technology itself during class dialogues can also contribute to successful interaction. Depending on the nature of the content, instructors may choose to switch to various sites or not switch as students participate (Baker, 1994). For example, students sometimes feel more comfortable talking about controversial topics or those more personal in nature if the camera is not focused on them. The instructor's "I'm listening" body language on the screen appears to be more effective in this situation in promoting the sharing of ideas (Baker, 1994). Also, posting directions to the TV screen when doing small-group break-out sessions helps keep the groups' focused on the topic and clear about what they are to do. The system can also be used to create a group if some of the remote sites only have one student attending. All sites with multiple attendees can turn their audio off, thus allowing the remaining sites to talk to one another during the break-out group discussion.

Finally, creating and using more active methods to gain and maintain attention and foster active participation is of paramount importance in interactive television. By changing the pace and the visuals on the TV screen frequently, and avoiding the "sit and watch" routine that simulates home-TV viewing, students/learners are able to remain engaged better throughout the class and have regular opportunities to dialogue with other students, especially at their site. Although many of these active methods can also be employed in traditional classrooms, they are even more important in distance learning environments. For example, wise use of interactive print-based course materials sent ahead to the sites can keep students actively engaged during the times that the instructor is lecturing/presenting. Utilization of trigger videos, magic, analogies, and stories can set the stage for role playing, simulation activities, and other site-based activities that help students focus on important course content in an active format (Cyrs, 1997). In short, creative teaching has a definite role in effective teaching at a distance.

Methods for Extending Interaction Beyond the ITV Classroom

When taking a course on campus, students are often expected to participate in group projects or meet outside of class to prepare presentations or other collaborative work. These kinds of activities are more difficult to achieve when teaching multiple sites of students at a distance, and in many cases, impossible due to the vast distances between remote site locations. Hence, faculty/trainers have become more interested in how to utilize supporting technologies to foster collaborative work between members of a learning community. Most faculty/trainers also claim that they can "cover" less material in a given class period on ITV than in a traditional classroom, and therefore, have a stronger interest in finding ways to continue the interaction between students/learners and the instructor beyond the live class time. This section will explore a few of them that are currently being used by distance instructors.

Probably the least expensive and most widely-available telecommunications technology is simple e-mail. As Internet access has become more accessible, more and more distance students have found that e-mail is one good way to stay in touch with their instructors/trainers and with other students in their classes. It can be used to support communication between members of small groups working on collaborative group assignments, for example. The listserv technology, or Unix-based form of electronic discussion groups, is also dependent on the use of e-mail. Listservs are a popular technology set up by instructors to foster class discussion. Once the students are signed up electronically, they use their e-mail software to post messages to the class as a whole and to respond to postings of other students, an ideal way to extend the verbal interaction beyond the live class time. Sometimes instructors post regular discussion questions, while other times, students help lead the discussion or just participate in an informal mode of communication.

In recent years, Web sites have become increasingly used to support classes/training for distance learners. These sites often include built-in electronic discussion forum software, allowing posting and responding similar to listservs, but not dependent on the additional subscription procedures required by listserv technologies. These forums are often threaded, meaning that several discussion topics can be going on simultaneously, but all messages on the same topic appear grouped together for easier reading. Web sites can also contain "chat rooms" for live interaction between the instructor and students, or between groups of students working on joint projects. To use this technology, students must all login at the same time to "talk" to each other live. Some instructors are using this technology to conduct scheduled office hours and to answer specific questions directed to them by students. For large classes, specialized topical "chats" can be set up, as well, to foster discussion among persons with similar interests or assigned tasks. In short, a host of telecommunications options are available to foster follow-up discussions after live class content or to set the stage ahead of time for live class discussion. These technologies are especially effective for supporting the building of a community of learners in any ITV distance learning class/course.

Interaction, then, is important to instructors and students/learners alike. Whether the interaction is encouraged during live class time or as a follow-up or lead-in to the live class, there are multiple options to foster it. Some require simple adaptation of interactive teaching methods used in traditional classrooms. Others are unique to the ITV teaching environment and may be dependent on the particular capabilities or limitations of the specific distance learning technology being employed. All require intentional planning on the part of the instructor to accomplish effective, efficient, and appealing interaction with all members of the learning community. Included below are a list of additional readings on interaction and effective distance teaching that readers may find useful as they continue to explore this important topic.

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Autobiographical Sketches

Molly Herman Baker, Ph.D., is currently an assistant professor of Instructional Technology and Telecommunications at Western Illinois University. In this capacity, she teaches courses about instructional design, the Internet in education, and telecommunications and distance learning. Her courses are offered via satellite, compressed video, and on the Web primarily to graduate students in the ITT program. Prior to her current appointment, she served as an instructional designer at WIU assisting faculty learn how to use technology in their instruction. She handled all faculty training and individual faculty support for those teaching at a distance. She completed her dissertation at the University of Iowa, studying effective methods for engaging remote-site students in ITV interaction. She also has worked with many other institutions of higher education in preparing their faculty to teach via ITV. In recent months, she has worked with faculty on their own campus learning how to develop courses to be taught on the Web.

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Enhancing Web Instruction: Using Streaming Audio and Video

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Equal Access to Software and Information (EASI)

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Equal Access to Software and Information (EASI)

Computer superstores and computer mail order companies are selling multimedia computers at very competitive prices. It is difficult to purchase a new computer that isn't equipped for video and audio. Web sites for radio and television stations are coming on-line daily. Today's classroom computers are frequently multimedia machines because they are being used to access rich software and content on current educational CD-ROMs. Besides displaying text and graphics, their images are animated. The also display video clips and produce sound: both spoken information and music. These enhancements are frequently used to capture the attention of students. but, they can do more than compete for students' limited attention spans; they are excellent means to convey educational content. The ability to reproduce multimedia is no longer a rare high-end product. Computers get faster by the month, and their disk and memory capacity is expanding at an amazing rate.

Software creators are taking advantage of these changing features to produce richer and more complex materials. However, the ability of teachers to produce their own materials using web authoring tools means that the production of multimedia content can be done by people with no understanding of sophisticated computer languages. The teacher can produce multimedia tailored for his or her particular needs.

This work is the result of a National Science Foundation grant, which was issued to EASI (Equal Access to Software and Information). EASI is part of the Teaching, Learning and Technology Group, a non-profit affiliate of the American Association for Higher Education. EASI is collecting and disseminating information to help students with disabilities in grades K–12 to succeed in the study of science and math. It is a follow-up to a similar grant that had focused on the needs of disabled learners in college and university. EASI has distilled much of this information and produced three online workshops, which are delivered several times a year. One workshop provides information on how to make a school's computer and information technology systems accessible to students with disabilities. Another focuses directly on special problems involved in the fields of science and math. The third describes how to design web pages for universal access. Frequently pages are unintentionally designed in ways that create needless barriers to people who are blind, low vision, learning disabled or mobility impaired. Universal design can create pages for everyone. Information on these month-long, online workshops, their schedules and fees is on the web at http://www.rit.edu/~easi. EASI also will provide on-site workshops.

Web Page Design

This presentation will focus on the uses of streaming audio and video over the web to deliver educational materials for K–12 students. However, before discussing audio and video, we have to look at web page design. If people are unable to navigate your web pages, they will never reach your audio and video. The first rule is to keep it simple! Pages that are crammed with information or with fancy graphics can be overwhelming to students with dyslexia and those with attention deficit disorders. They can make it difficult for low vision students to read as the frequently enlarge the screen with magnification software permitting them only to look at a portion of the screen at a time. A content-laden screen may have them lose track of which portion of the display they are looking at.

The second rule is to choose your background and foreground colors carefully. Instead of picking your favorite colors or something unusual, select colors for their readability. Be sure there is good contrast, and try to avoid colors that create glare and eye strain. This is important for helping people who are color blind or have visual processing difficulties. There is no correct combination. Different disabilities and different people with the same disability may have their own unique preferences. All you can do is to do your best and to make your color choices intentionally.

Third, be sure that all of your navigation tools such as buttons are not too small or too close together. Some people who are not even disabled have poor eye-hand coordination, and people with motor impairments certainly appreciate large navigation aids. Larger buttons also make navigating your pages faster for everyone if they do not have to make careful, precise mouse movements.

Fourth, you need to remember that blind students will have no way to read your graphics or icons. Blind computer users will be using screen reading software and synthesized speech output. Even the most sophisticated screen reading software cannot identify pictures. The student will be accessing your pages with a text browser or a regular browser with graphics turned off. The reason for turning off graphics is that then the browser will display any alt-text tags attached with a picture. One of the features of the HTML web code is that you can associate an alt-text tag with an image. When a browser does not display the picture, it will instead display the alt-text tag. The blind user can then know what the picture is. Without the tag, the browser displays the word, "image." This is extremely important if the picture is important for content. It is also important if your picture is, in fact, a hyperlink. The tag can let a blind user know what the link goes to. Otherwise the browser just displays the word "link" which is not very meaningful.

For more details on universal page design, visit http://www.rit.edu/~easi and select the universal web design link, You should also select the link on disability legislation. The Americans with Disabilities Act and section 504 of the Rehabilitation Act require that you make your pages accessible. There is an increasing number of Office of Civil rights cases enforcing this. As information technology becomes standard in education, students with disabilities are filing more complaints and receiving support on the school's obligation to provide information technology in formats that will include them.

Creating Streaming Audio and Video

Graphics and animation are already used on web pages to capture the attention of students. The advantage of using audio and video is that these technologies are well suited to content delivery. Beyond catching student attention, audio and video can provide rich education material simultaneously in various output formats to meet the different learning styles of different learners. Some students are visual learners; Some are auditory learners. Many do best by experiencing the content in dual sensory modes. This capability carries an unexpected bonus; it also is a tool to include disabled students within the mainstream classroom. Dual sensory output means that both students who are blind and those who are deaf have access to the content without special adaptations. While both audio and video can be used in ways to leave out students who are blind or deaf, they can just as readily be used to fully include students with disabilities into mainstream education.

Creating audio and video Web content was a dream five years ago. Today the net is literally exploding with everything from the latest hit CD-ROM, to the latest movie premier. Sites like TV.com, broadcast.com, msnbc.com and hundreds of others allow you to hear and see thousands of clips, both live and on demand.

Encoding audio and video is nearly as simple as being an end user. Developers like Progressive Networks, makers of RealAudio/Video servers and players, are a good example. Utilities like RealPublisher provide utilities for audio and video encoding that allows the creator to choose baud rate and many other options that formally required advanced technical knowledge.

For example, if you are creating content that will basically be accessed by users who are connected directly to the Internet like an educational institution or computers on a LAN, you can encode at a higher baud rate, which will enhance quality of delivery. If, however, you are creating content for anyone on the Internet to access, you should take into consideration the fact that many users are connecting with lower baud rate modems. Choosing the best encoding for your particular audience is a matter of clicking the appropriate option from a pre-configured menu.

The procedure for creating a RealAudio file is a five step process.

1. Open RealPublisher
2. Choose New Session from the File menu.
3. Click on the Save As button and give the file a name.
4. Click on the baud rate of your choice from the pre-set options.
5. Click the Start button.

The procedure is exactly the same for video encoding. You will need a video capture card to encode video from a VCR, or a camera for live creation. The baud rate at which you encode video is much more important than it is with audio. The baud rate pre-set choices start at 2800 bytes per second.

There are two particular areas of access to multimedia that present challenges to many people with disabilities. In order to include all people, audio must be delivered to the deaf and hard of hearing and video content must be available to blind and people with other visual processing difficulties. To ensure that these populations are included in multimedia presentations, two scripting tools have been developed.

In June of 1997 Microsoft announced the development of a scripting language called SAMI. Synchronized Accessible Media Interchange allows multimedia content providers a way of including closed captioning for video content. SAMI is used with Microsoft's DirectShow media player which is a free plugin that understands the SAMI scripting language.

The other scripting language used for encoding multimedia is called SMIL, Synchronized Multimedia Integration Language. The World Wide Web Consortium developed SMIL. At the writing of this paper, Progressive Networks has introduced the latest version of RealPublisher, which has SMIL incorporated in its encoding tools. This is the first authoring tool developed to give the novice multimedia creator the opportunity to incorporate captioning in their work. Such encoding tools will allow those developers who may not have or take the time to learn a scripting language, the opportunity to deliver their work so that all people can access it.

What these scripting languages allow developers to do is this. By having the transcription of the audio in an audio/video clip, you can synchronize the text of the audio to be displayed at the same time it is being spoken on the clip. The effect would be the same as watching captioned videotape or a television show.

Conclusion

Besides being able to convey content simultaneously in dual sensory outputs, multimedia can be used as a motivational tool. It can convey feelings and attitudes effectively. One of the major barriers for students with disabilities are the negative attitudes of society including teachers, parents and the students themselves. Successful role models are extremely important for students, and both teachers and parents can be encouraged and challenged by the examples of successful professionals with disabilities. As part of EASI's NSF grant, it is using audio and video clips by people with disabilities that are pursuing careers in science and math. There are, in fact, many hundred such professionals, but a student with a disability and his or her parents and teachers are likely not to be aware of this. Listening to and watching someone who has overcome similar barriers is a powerful way to impact these negative attitudes. If this is true for students with disabilities, it is also true for other students struggling against other negative social attitudes.

Many people with disabilities fear the rapid expansion of multimedia as they fear it will be another exciting innovation that will exclude them. This is true of some products. Some of the early educational multimedia programs cannot be used by blind students, and deaf students are left with no way to access its audio. This is not an integral part of the multimedia system; it is the result of the design of a particular product. In fact, multimedia has the possibility of providing educational materials that include everyone more effectively than any other educational material.

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Distance Learning Course Design

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The need to develop life-long learners is becoming increasingly more urgent as we move into the 21st century. Technology and the move to a global society demand continuous adaptation and change for those of us in education and business as we strive to upgrade skills and acquire new knowledge. Traditional methods of delivering instruction are no longer meeting the needs of retaining and attracting students; adult learners need to relate to the material presented, see an almost immediate application for the knowledge or skills, and have this information be readily available to them when they need it. However, using distance learning whether it be via web-based courses or interactive television is a decision not to be made because of the seductiveness of the technology. In order to make an informed decision about the appropriate use of distance learning, a systematic approach to designing instruction should be firmly in place and should be driven by the needs and goals of a particular learning situation.

Figure 1 is a graphic representation of the design process in a puzzle form composed of a series of interlocking pieces; this process is not depicted as linear because of the reiterative nature of the of the process which may begin at any point. To be most effective, the process must begin with identified learner needs and relate to organizational/institutional goals. This does not mean that during the development of a course that the needs and goals are static because budgetary, technological resources, or the skill limitations of the instructor/designer may have a significant impact on the instruction. The design model we used is derived from traditional instructional design models (Kemp 1985; Dick and Carey, 1990; Romiszowski, 1984, etc.). However, the fluidity of the model lends itself to the ever-changing nature of distance learning.

Ehrlich/Reynolds Decision Model

Since many college courses are designed with a minimum of technological support, let us first look at the basic questions raised by an instructional designer as he/she goes through the process of developing instruction.

Needs and Goals

In the analysis phase, a consideration of the potential problems need to be addressed. These needs and goals may change as the project takes shape because the primary concern is client-centered. Because of the time-consuming nature of front-end analysis, many instructors/clients want to skip this stage. Very often the decision is made to use distance learning so that we may be more competitive in the marketplace, but this is not necessarily the best instructional strategy. For the advanced instructional design course, students will be designing instruction for a client, so using E-mail and other strategies are a more efficient way to not only gain access to the "client" but to keep in contact with other members of the class. The basic needs of the students are to understand key design concepts and terms, see examples of the process so that they can internalize it, and to have access to an instructor or other subject matter experts.

Questions to identify the needs and goals are:

- What are the desired outcomes of instruction?
- What performance deficiencies is instruction designed to address?
- What systems or strategies will be used to assess these needs?
- Do the instructional goals match the learner characteristics and available resources?
- Have you projected potential future needs?

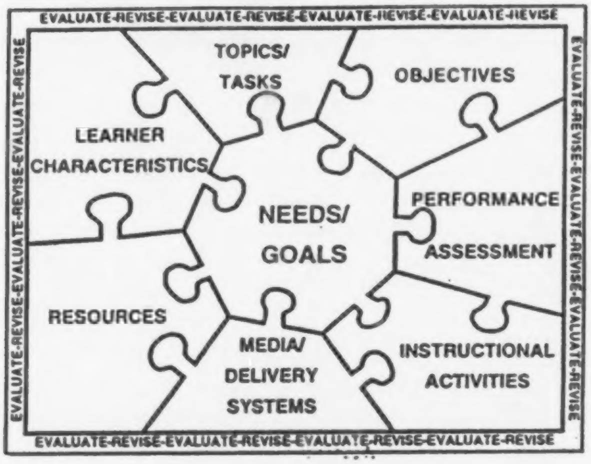
EVALUATE-REVISE-EVALUATE-REVISE-EVALUATE-REVISE-EVALUATE-REVISE
TOPICS/ TASKS
OBJECTIVES
LEARNER CHARACTERISTICS
NEEDS/ GOALS
PERFORMANCE ASSESSMENT
RESOURCES
MEDIA/ DELIVERY SYSTEMS
INSTRUCTIONAL ACTIVITIES

Figure 1

Note. From *Interactive Learning International,* Vol. 8, No. 4, October-December 1992, pp. 281–289. Copyright © 1992 by John Wiley and Sons Limited. Reproduced by permission.

Learner Characteristics

Learner characteristics reflect the demographics, learning styles, readiness, and motivation to learn of the target audience. Variables such as learner expectation affect the amount of time, the level of instruction, and the varied approaches that are required. Web-based instruction enables the instructor to individualize learning to accommodate many of the factors. Examples can be developed to appeal to the cultural differences or experience level of many students. Video and graphics can be embedded in the instruction to support visual learners, while audio can support learners who prefer to "hear" things. By providing a range of examples, students adjust the time they need to spend to grasp a concept. A comfort level and easy access to computers is essential is the course is be web-based.

Questions to identify learner characteristics are:

- What demographics are important when designing instruction (gender, ethnicity, age, etc.)?
- What is the size of the learner group?

- Where are the learners located geographically? Is access a consideration?
- What are the attributes of the learners? Are there particular strengths or limitations that would have an impact on instruction?
- What are the learning style preferences of the group? Does this have an impact on the instructional design?
- What prerequisite skills do the learners have/need? How will you address these differences?
- Are learners there by choice or are they required to attend?
- What expectations do learners bring?

Topics/Tasks

Topics/tasks are identified by performing a content analysis. The advanced instructional design class and the computer-based training class both identified competencies needs by students entering the HRD field. When designing these classes subject matter experts and exemplary performed helped develop the content and provided specific skill sets that needed to be mastered. Because of time constraints, it was also imperative to focus instruction on the "need to know" elements rather than the "nice to know." One of those elements in the design class that fell by the wayside deal with changes in the field of instructional design. In the computer course, it was even more necessary to focus in on instruction and we determined that an overview of web-based course principles was more expedient that learning an authoring language like html.

Questions to identify task/content issues are:

- What skills do the learners need to acquire/master to perform the task(s)?
- What changes in learner behavior and attitude do you want to take place?
- What content areas need to be covered?
- What sequence is most effective to learn how to perform the task or to understand the information (hierarchical, functional, general to specific, etc.)?
- What domain(s) is instruction geared to (cognitive, psychomotor, affective)?

Objectives

Objectives/Outcomes are related directly to the goals and focus on desired learning outcomes. They need to be communicated in measurable terms, so that the success of instruction can be measured. Learner objectives are similar whether they are in distance learning or on-site instruction. An excellent source for guidance in developing objectives is the work by Robert Mager. Adult learners tend to use objectives to measure their own accomplishments, so it is important to make these known at the beginning of the instruction.

Questions to identify whether objectives have been written correctly are:

- Are the objectives derived from the goals?
- Are the objectives stated in measurable terms so that the learner understands what he/she is accountable for?
- Do the objectives contain actions, conditions, and criteria for performance?
- Are the objectives sequenced appropriately for the tasks/content?
- Do the objectives reflect the desired domains?

Performance Assessment

The methods of assessing performance need to match the desired outcomes of instruction. This may range from simple on-line tests to working through complex case studies. As of this time, we have not been able to develop on-line case studies but they are in process. The use of video, audio, and text-based artifacts to support cases would be a valuable addition to instruction, but many students don't have the necessary technology to support this. In the design class, we are currently using on-line simulations that can be downloaded.

Computers also provide students with the opportunity of getting instant feedback on short quizzes so that they can measure their own progress and review materials at their own pace. Performance assessment should take place immediately following instruction to determine if learning took place and how the student reacted to instruction. If instructors feel that a test needs to be taken in a classroom setting, the students can be asked to come in; however, the equivalent of take-home exams are a better vehicle for on-line instruction.

Questions to identify performance assessment issues are:

- What criteria/standard is necessary to demonstrate mastery?
- Is the level of mastery attainable by the learner?
- Under what conditions will the performance assessment be conducted?
- Is a prerequisite skill inventory required before presenting the program?
- Does the evaluation match the domain specified in the objective?
- Have activities been to assess learner performance that are congruent with objectives and domains?
- Is time a relevant factor when evaluating performance?

Instructional Activities

Instructional activities are the learning experiences developed to present instruction and allow learners to demonstrate their ability to meet the desired performance level. Learning activities may range from delivering lecture-based materials using a Powerpoint presentation package to integrating case studies or problem-based learning. The entire case may be presented on-line or students may use the internet to look up resources to find information suggested by the case. The number of activities and information to support each learning objective must be carefully considered because time is an important element to adult learners. The series of learning experiences need to be sequenced for skill building. In the Instructional Design II class, each component of the model is presented and learning experiences build upon one another as students learn different aspects of the design process. Materials are similarly layered in the Computer-Based Training course, so that students first understand an overall context and then gradually learn additional skills as they add more complex layers to the design of their training.

Questions to identify the issues in designing and developing a range of instructional strategies are:

- What are the most effective ways of presenting this material to the learner?
- Is there a need for pre- or post-instructional activities to support the learning?
- How much learner control of the learning process is desired (self-paced, mastery, etc.)?

- Do the strategies match the learner characteristics? Is there sufficient variety? Are the learners actively involved in the learning process?
- Have sufficient time and activities been designed to ensure mastery and transfer of learning?
- Are the instructional strategies compatible with the resources available?
- Do the activities match the task, topic, and domain requirements specified by the objectives?
- Have the learning activities been designed based on logistical concerns (comfort, space, convenience, etc.)? Has there been sufficient time allocated for breaks and refreshments (if applicable)?
- Has the instruction been designed in such a way that the learner can bookmark his/her place and then return to the instruction?

Instructional/Delivery Systems

Choices for the delivery of instruction are numerous; being freed from a classroom environment provides a whole world for learners to explore via the internet. To just transfer lecture notes to a computer, as many instructors do, is to not take advantage of the technology. The selection of instructional delivery systems requires far more analysis than just to decide to use the technology without exploring how to best take advantage of its capabilities. Examples of changes in the instructional process include both spacial and temporal elements; instruction is no longer space bound or time bound. Students can access instruction when it is convenient and can have access to expertise anywhere in the world. Instructors need to be willing to exploit new technologies and understand the strengths and limitations of a variety of media.

Questions to be asked when exploring instructional/delivery systems include the following:

- Has an in-depth analysis been done to explore the options available to support instruction and make the most informed choices?
- What are the advantages and disadvantages of each type of delivery system (print, hands-on, slides, field trips, computer-based training, interactive, etc.)?
- What are the most ideal systems for presenting the instructional material?
- How do learner characteristics impact the delivery of instruction?
- What constraints or limitations are there due to the current investment in particular instructional systems?

Resources

Resources impact all stages of the design cycle. Limited resources may determine the level of complexity used in computer-based-instruction. Print-based material like a syllabus is easily transferable and many instructors use the WWW to put their lecture notes on-line. It lowers the cost of reproducing handouts and other materials. However, this use does not add anything to the instruction. Many instructors prefer not to work with the technology because of their own lack of comfort with the equipment and the lack of technical support when the equipment fails. One solution to this problem is to assemble a cross-functional team of people interested in working with the technology, thus maximizing the expertise of the group. Key members of the team could include programmers, graphic artists, instructional designers, project managers, media specialists, and writers.

Questions to ask that refer to available resources include:

- What are all the resources/constraints impact the project?
- What is the expertise of the designer/design team? Are choices limited because of a lack of expertise in specific media? Should additional expertise be added?
- Has sufficient time been allotted to design the program?
- What costs are connected the design, development, and production of materials?
- How can the best use be made of the allocated budget?
- What equipment and materials are currently available?
- Are there materials already developed which can be used or repurposed for instruction?
- Has the administrative and clerical support needed for the project been provided? Are they available?

The entire design process goes through a reiterative cycle as the course is implemented. As our courses were subjected to a formative evaluation, several changes were made. The instructors wanted control of when students accessed particular segments of the material so that they could not move through the course too quickly. Our courses blended classroom teaching with Web-based instruction. Students used E-mail to communicate with the instructor and then we added chat rooms so that they could communicate with each other. Case studies were added, but still need to be refined. Each time the courses are taught, student input provides us with new things to try, but at this point in time, we are still not completely replacing classroom interaction; we are supplementing it. Our adult students prefer to have the opportunity to meet face-to-face, but they do like the freedom to integrate both distance learning and in-class instruction.

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Autobiographical Sketches

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Instructional Design Considerations When Videoconferencing Is the Primary Mode of Delivery and Interaction

Jim Friscia
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Overview

Today, more and more higher education courses are using some combination of synchronous and asynchronous communication tools for delivery and interaction. Whether offered at a distance or in a traditional on-campus classroom, collaborative communications tools are being used to present content, deepen interaction, and increase communication between instructors and students.

A variety of "hybrid" or "blended" delivery methods are being developed that combine technologies and techniques—on-campus meetings, e-mail, computer conferencing, videoconferencing, the web, videotape, etc. Generally, though, one method is the primary mode of delivery, instruction and interaction. This session will look at some of the considerations when interactive videoconferencing is that primary delivery method and how to integrate other communication tools to enrich the teaching and learning process.

Workshop Goals

The session goals are to explore the following questions:

- What are the most important design factors for a successful interactive video course?
- How can instructors take advantage of the strengths and overcome the limitations of this medium?
- How are instructors using asynchronous communication tools to enhance interaction and learning? Which tools work best for what types of activities?
- How can instructors move to more learner-centered activities that take advantage of the collaborative nature of these tools?
- What are the most effective ways to acclimate both students and instructors to the "teleclassroom" environment and process?
- What are effective strategies to handle the increase in administration and management of course assignments, activities and materials?
- How will instructors move from teaching solo to an instructional "team" process? Who's on the team and how can they help?

Design Considerations for Interactive Video Delivery

There has been a great deal of information written on how to use videoconferencing for distance learning. Instructional Television (ITV) has been around for a while and face-to-face videoconferencing is not a new technology for either higher education or the corporate world. An exploration of the books, articles and workshops focused on helping instructors work through the issues of designing and delivering courses via interactive video reveal a common set of themes and techniques. From these sources and the experiences of instructors with whom I have worked (and my own), the following are key factors for creating effective courses via interactive video.

- The first is to understand your students. Who are they? What is their level of subject knowledge and experience? What is their level of motivation? What is their experience as a distance learning student? What communication tools do they have available? Having this information will impact the design and deliver of a course.

- Always establish learning goals and outcomes. Instructional design, whether for a traditional classroom or distance delivery flows from the goals and outcomes. And, design learning activities to achieve those outcomes. For interactive video courses those activities will also need to work within the characteristics of the medium. Hence . . .

- Become familiar and comfortable with teleclassroom tools and techniques. Comprehensive training and allocating sufficient practice time in the teleclassroom is a critical. In addition, it will be just as important to acclimate your students to the interactive video classroom.

- Use the strengths of interactive video by using visuals—graphics, video, etc., and maximizing interactivity, both student–instructor, and student–student. Use appropriate and varied presentation methods—limiting traditional lecture, and encouraging discussion.

- Integrate multiple tools for content delivery, interaction and course management. Choose tools based on learning goals, activities, and access. Use what many now call a "blended technology" or "full menu" approach: integrating available online and other tools with videoconferencing. How can you use face-to-face meetings, prerecorded videotape or CD-ROMs, e-mail/discussion list, web sites, voice mail, audio conferencing or computer conferencing to augment interactive video delivery?

- A team approach to design and delivery is essential. Who is your team? How will you work with instructional designers, technical support staff (video and computer), site coordinators, and administrators to plan your course?

- Thorough course planning—writing detailed lesson plans that cover content, presentation methods, interactivity, learner involvement, learning activities (both in and out of the classroom), and course management—will help ensure successful delivery. Pay close attention to administrative issues such as scheduling, materials management, and site facilitator responsibilities. These need to be integrated into the overall planning of the course.

- And, finally, evaluate the experience. Do ongoing, formative evaluation to monitor quality and make revisions in content and instructional approach as needed. Use summative evaluation at end to revise, fine tune, or, if necessary, restructure the course before delivering it again.

Acknowledgements

I would like to acknowledge some of my fellow trainers and faculty members who continue to contributed their ideas and experiences to help others teach via interactive video.These are some of the best practitioners and instructors in the use of videoconferencing and technology to teach at a distance. Their articles, books, workshops and web sites are among the best resources for instructors delivering distance learning courses. These include: Rosemary Lehman and Bruce Dewey of the University of Wisconsin–Extension; Douglas Young of the Southwest Center for Advanced Technological Education (SCATE); Dr. Guy Bensusan of Northern Arizona University; Barry Willis of the University of Idaho's College of Engineering; Tom Cyrs of the Center for Educational Development, New Mexico State University; Jodi Reed of San Diego State University; Jeffrey Klivans of the University of Maine; Howard Major and Nancy Levenburg of Distance Learning Dynamics; Ellen Wagner of Informania, Inc.; Carol Daunt of LearnTel Pty Ltd.; Virginia Ostendorf of Virginia Ostendorf, Inc.; Don Foshee of Innovative Interactions, Inc.; and Janet Bernhards.

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Autobiographical Sketch

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Quality Assessment in Distance Education

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Introduction

Throughout the 20th century, accelerating change has often overtaken even the most stable of our social institutions, and the rate of such change will no doubt increase with gathering speed in the new millennium. Higher education is one institution that has felt the impact of tremendous change-particularly in the field of technology. The rising intensity of this new wave of technology, combined with the growing need felt by many to increase their learning to survive economically, are affecting higher education institutions as well as other organizations. Concepts of lifelong learning, individualized or personalized learning, and time-free, space-free "just-in-time" learning arrangements are emerging, all of which allow learning away from the traditional campus or worksite classroom. In this changing environment, particularly with the advent of learning at a distance, it is both difficult and exciting for students and institutions—or as we refer to them in this document, learners and learning providers. As institutions find themselves challenged to respond to such massive changes, it's often possible to lose sight of the larger mission of the institution itself.

To help meet this challenge, the American Council on Education and the Alliance: An Association for Alternative Programs for Adults created a broadly representative national task force on distance learning. The charge to the task force was to formulate a set of guiding principles for learners, providers of learning, and those responsible for overseeing learning quality and effectiveness informal educational programs.

The task force's objective was to formulate principles that could guide learners, educators, trainers, technologists, and accreditors/state regulators in the development, delivery and assessment of formal learning opportunities. The key issues addressed include:

- How advances in technology affect higher education and postsecondary-level training.
- How quality can be assured in the development and delivery of distance learning.
- How distance education programs may be "student centered."
- What are the core values that support a learning society?

The Guiding Principles for Distance Learning in a Learning Society (1996) is not a treatise or how to for institutions, organizations, or learners. Rather, it is a statement that is designed to address the qualities that should characterize the learning society in the years ahead. By design, the principles do not prescribe specific technologies, strategies, or methodologies, nor do they promote learning at a distance; instead, the focus is on understanding and embracing the changing nature of the education and training process.

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Guiding Principles for Distance Learning in a Learning Society

Developments in technology and communications have brought about dramatic change in both the learning needs and the way learning opportunities are delivered in the world of business, labor, government, and academia. We are becoming a society in which continuous learning is central to effective participation as citizens and wage-earners. Telecommunications technologies are not only transforming our needs for education and training, but they are expanding our capacity to respond to these needs. Distance learning, with a long history of serving isolated and remote learners, is now emerging as part of mainstream education and training efforts to provide learning opportunities that are flexibly responsive to learners' needs.

The following principles recognize that distance learning is becoming a key component of this new learning society, in which learners must take increased responsibility for control and direction of the learning process. Existing standards and criteria, often focusing on learning inputs, fail to acknowledge the many forms that effective learning can take; therefore, the focus needs to be on learning outcomes. The principles here are intended for learners, providers of learning, and those charged with the oversight of learning quality and effectiveness. These principles address central qualities that characterize all effective learning activities, regardless of setting or purpose, and are of special relevance to the practice of distance learning.

Definitions

Distance learning is a system and a process that connects learners with distributed learning resources. While distance learning takes a wide variety of forms, all distance learning is characterized by:

- Separation of place and/or time between instructor and learner, among learners, and/or between learners and learning resources.

- Interaction between the learner and the instructor, among learners and/or between learners and learning resources conducted through one or more media; use of electronic media is not necessarily required.

The learner is an individual or group that seeks a learning experience offered by a provider.

The provider is the organization that creates and facilitates the learning opportunity. The provider approves and monitors the quality of the learning experience. Providers include schools, colleges and universities, businesses, professional organizations, labor unions, government agencies, libraries, and other public organizations.

Core Values

These principles assume that the practice of distance learning contributes to the larger social mission of education and training in a democratic society. With that in mind, the principles reflect the following tenets and values:

- Learning is a lifelong process, important to successful participation in the social, cultural, civic, and economic life of a democratic society.

- Lifelong learning involves the development of a range of learning skills and behaviors that should be explicit outcomes of learning activities.

- The diversity of learners, learning needs, learning contexts, and modes of learning must be recognized if the learning activities are to achieve their goals.

- All members of society have the right to access learning opportunities that provide the means for effective participation in society.

- Participation in a learning society involves both rights and responsibilities for learners, providers, and those charged with the oversight of learning.

- Because learning is social and sensitive to context, learning experiences should support interaction and the development of learning communities, whether social, public, or professional.

Principles Overview

Five principles emerged from the taskforce discussions, each with a series of six to eight subprinciples associated with it. The major guiding principles for distance learning in a learning society are as follows:

1. Learning Design

Principle: Distance learning activities are designed to fit the specific context for learning

- the nature of the subject matter,
- intended learning outcomes,
- needs and goals of the learner,
- the learner's environment, and
- the instructional technologies and methods.

2. Learner Support

Principle: Distance learning opportunities are effectively supported for learners through fully accessible modes of delivery and resources.

3. Organizational Commitment

Principle: Distance learning initiatives must be backed by an organizational commitment to quality and effectiveness in all aspects of the learning environment.

4. Learning Outcomes

Principle: Distance education programs organize learning activities around demonstrable learning outcomes, assist the learner to achieve these outcomes, and assess learner progress by reference to these outcomes.

5. Technology

Principle: The provider has a plan and infrastructure for using technology that support its learning goals and activities.

Questions remain to be grappled with including how do we use these principles and subprinciples to assess the quality of our distance education and training systems and processes? This key question and an elucidation of the principles and subprinciples will be the focus of the post conference workshop.

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Autobiographical Sketch

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Team Teaching Today: Who Wouldn't Want to Do It?

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"Media is an entity unto itself that must be reckoned with on its own terms." Media Virus, Rushkoff.

In less than 25 years there will be no one alive who was not raised without television as a vital, natural, integrated part of their daily lives. The credibility, marketability and believability of any event is enhanced and elevated to importance just by being on television. It is estimated that over 65 percent of Americans get all their news from television and that 90 percent of American homes own TVs.

The above is only a reference to the power and necessity of using television for learning, specifically delivering distance education.

The problem educators face in trying to use technology to educate is that educators are being passengers instead of driving this technical juggernaut.

Education always has been, and will remain, a people intensive enterprise, and if you want to improve the school and the education level, you must improve the skills of the teachers. Technology alone does not and cannot change or improve teachers, curriculum or education.

Teachers should be at the top of the education pyramid and in the forefront of adoption and integration of technology.

However, many teachers are intimidated, untrained or unable to compete in this recent but here to stay, growing arena of education. Those teachers that can teach on and with television are going to be the most valuable education commodity of the millennium.

Let's examine a few of the myths of education—for students and teachers:

- **No pain, no gain**—This is absurd. Learning works better when it is fun—we retain and repeat what we enjoy—all our senses are heightened during games and play.
- **Know the basics**—Good but not good enough because, if life teaches anything it is that there is no one way to do anything—experiment, trial and error. Fail, learn, fail, learn, that's how it really works.
- **Try to know everything**—Nuts to that bromide—you can't do it. The truth is intelligence isn't the same as knowledge—true intelligence is the ability to be open to change, to new ideas and to
- **Use** what you know to learn more.

- **Harmony and balance**—Nothing could be more destructive than harmony in a classroom Controlled crisis, yes. Creative friction, yes. Education is no longer a mirror image of the assembly line but instead unique individualism is to be expected and encouraged. A respectful environment filled with inquiring abrasive minds "creating and destroying at the same time, polar opposites and closely related cousins."

Teachers are the only ones who can develop an environment of positive, creative, chaos necessary for today's education, and television is the media of choice. The late Timothy Leary, who wanted to die on the internet, was quoted in 1993 "There's no such thing as educational television. That's the ultimate oxymoron. The ability to change what's on the screen is the tremendous empowerment."

He may have exaggerated a little, but not much—the power of television in the control of trained, savvy, teachers who understand how it works and will use it can revolutionize education.

The television teachers must become more than a teacher. They must be *actors, anchors, students, hosts, guests*, but most of all they will be what Neal Stephenson refers to as "*avatars*: audiovisual bodies that people use to communicate with each other."

These "avatars" or teachers will be responsible for creating an educational environment that meets the three defining features of American modern life: *speed, convenience,* and *entertainment*.

How can currently trained teachers achieve this? Team teaching is an interim answer until there is a fundamental, philosophical, teutonic plate shift in educator's thinking.

The rules of the classroom theory won't work on television or with students that are more media aware than the teacher. Single source suppliers of education are not only dated, but dangerous and dead for the Gen-Xers and those students that follow.

From experience, we know that there are four factors that contribute to the success of individual teachers on television:

- They have access to technology and *human* resources.
- They work (teach) in an atmosphere of shared interests.
- They seek outside help for acquiring new ideas and skills.
- They have regular on-site assistance.

In addition to the above success factors there are strong personal growth indicators for teachers using television/technology:

- They raise their expectations for student achievement.
- They become more comfortable in presenting complex, challenging material.
- They are more willing to individualize students.
- They encourage and reward independent initiative.
- They shift from teacher-centered to student-centered content focus.
- They achieve a perspective and relationship with technology as a liberating not inhibiting tool.
- They discuss the intangible joy of education as entertainment and "hard" fun

If success and personal growth results are achieved by individual TV teachers then team teaching can provide even greater benefits for not only the teachers who acquire and practice their skills, but for the students, the symbiotic half of this educational equation.

A definition of Team Teaching must obviously include the technical, personal, the administrative, etc.; but for the purpose of this paper, we are only concerned with the instructional teachers who, together present the same content at the same time for the same student audience. Team teaching means more than one although three could be a realistic number for a 2–4 hour course.

The result of several individual teaching personalities actually creates a new personality which is the individual + 1 called the "avatar" personality of the televised teaching experience.

The teachers who are psychologically, philosophically and physically prepared to risk the team teaching experience will achieve the following benefits:

- The opportunity to share expertise academically with their peers
- Ability to distribute the time pressure of tele-teaching
- Enjoy the opportunity to both teach and reflect simultaneously
- Mentor or to be mentored in a new teaching environment
- Belong to a content strong planning team
- Have the psychological freedom and security to understand peer support.
- Ability to draw upon multi-personalities for any situation at any time during the lesson
- Aid in long term, on-going staff development—learn by doing
- Create flexible, multi-layered challenging curriculum
- Become a more valued resource to the institution (i.e. worth more money)
- Explore the opportunity to place fun into the content as a teaching methodology
- Allocate the technological workload at various times in order to keep teachers focused on content
- Serendipity—you never know what rewards or experiences may happen in such an environment

The students will also derive some unexpected results from team teaching. Keep in mind the primary goal of teaching is student learning—and for that to happen you must create the proper environment in which students can and want to learn. And remember, television is their appliance of choice. They will thrive on the speed, convenience and entertainment team teaching provides. They are beyond the MTV generation. They are the cyberspace generations.

Although no studies have yet been conducted on student achievement from team teaching, the benefits may include the following:

- Increased awareness level due to unpredictability of content presentation
- A more collegial and familiar learning environment
- An opportunity to freely express themselves and their viewpoint due to "avatar" personality
- Accelerated learning due to pacing and energy of television format
- Increased use of language because of comfort level

- Exposure to a greater variety of teaching experiences and content depth
- Greater mental engagement over sustained period of time because of the familiar learning environment

Will students learn more by watching TV is not the argument—the fact is that all students prosper in a learning environment, which is still created by the teacher or the team teachers. Technology doesn't do the teaching or make better teachers; but it does offer the methods, opportunity and support to better teach "cyber students" in the manner in which they have become accustomed, and which they understand.

Television team teaching can be learned. If a teacher is currently TV teaching, they can transition. This process of learning, and developing team teachers, can be describes in four distinct stages:

- **Stage 1**—Introduction to the television process and the technology—mentoring here can be very helpful. Learning technology terminology, acquiring technology skills and comfort level—no way to avoid this jump in the water feeling.

- **Stage 2**—Being assimilated to the process. Achieving a trial and error attitude, wanting to explore, losing the fear of failure beginning to challenge yourself and students with applications. Improvising on occasion—injecting technology into familiar material. Aware of team members but still single in your approach.

- **Stage 3**—Integrated and cohesive from initial planning stage of curriculum—who on the team does what, when, how and more importantly why? Extremely comfortable with improvisation may actually "force" technology into the content.

- **Stage 4**—Invisible to everyone, technology is seamless, transparent, flows from person to person—event to event—the emergence of this "avatar" concept is complete and teachers, students, technology, and content blend into a total learning experience.

The following theater and television terminology will suggest the techniques and strategies necessary for team teachings to adapt and utilize from introduction to "avatar" state of instruction:

- The anchors toss—it's your turn now.
- Sharing at all times—be a star from afar.
- Listening is learning—you're on even when you're off-camera.
- Timing is everything—like a fine watch made of little vital parts.
- Ability to not have the answer—just toss it, like a salad.
- Pace—nothing takes long. The thirty-second commercial is an entire story.
- Personality is very important.
- A close-up is worth a thousand words.
- The language of television is pictures.
- Variety, variety, variety is not redundant.
- Entertaining education is enduring.
- Friction is fun.

To prepare their curriculum for tele-teaching, the team should study the marketing industry in designing their product (course) and basically consider five single guidelines:

1. **Personality**—This course must have a unique personality of its own which envelops but reflects more than the personalities of the teachers. It must have a familiarity, be easy to relate to and be consistent.

2. **Compelling benefit**—It must present a clear, specific, single-minded benefit to the students—an if I take it, I will ___________ definition.

3. **Break the pattern**—It must have its own intrinsic value and be unlike any other course ever taken—no clone courses. It must excite both the eye and the ear. The teachers must constantly maintain this uniqueness, promote it, and be part of it.

4. **Generates trust**—It must be simple, direct and emphatic about what it (the course) will do and then do it. The team must constantly reinforce and demonstrate this trust not only in the course but in all the team members.

5. **Appeal to heart and head**—The course should touch emotions as well as the practical side of students. Engagement is not only intellectual but also emotional and the teachers must function with a passion, not intellectual objectivity. Teach and design with a passion to create involvement and enjoyment from the students.

Having covered definitions, benefits, techniques, and design guidelines for team teaching for distance education, it would only be appropriate to conclude by proposing some future projections.

I suggest that television team teachers or "avatars" of the cyber classroom of the future will provide, prove or possess the following:

- They will not belong to a union, but will possess autonomy over their classroom and content.

- They will exhibit performance skills and a philosophy of teaching that cannot be transferred to lesson plans.

- They will be the leaders of the movement to reverse the bureaucratic pyramids of education.

- They will inspire, encourage and redefine the return to student eccentrics and individualism.

- They will have the ability and power to generate both students and income, for institutions, in increasing proportions.

- They will be making the political, financial and curriculum decisions.

- They will be the decision-makers and dictate to the technology merchants what they make and how it will be used.

- They will have the ability and opportunity to achieve rock-star status and the influence that accompanies that status.

Team teaching on television and loving it! Who wouldn't want to do it and as soon as possible?

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Teaching Information Literacy Skills in Online Courses

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Information Literacy

In January 1989, the Final Report of the American Library Association Presidential Committee on Information Literacy stated that:

> To be information literacy, a person must be able to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information. . . . Ultimately, information literate people are those who have learned how to learn. They know how to learn because they know how knowledge is organized, how to find information, and how to use information in such a way that others can learn from them. (p. 1)

Even if information literacy is not a formally stated course goal, it is usually implicit in other course goals that target critical thinking, awareness of controversy and disagreement in a discipline, the development of academic thought and discourse, or research writing. Indeed, almost any college class is likely to touch upon information literacy and often in a significant and meaningful way.

Scientific Information Literacy in Chemistry 100 Online

Parkland College's Chemistry 100: Introduction to Chemistry is a developmental course designed for students with little or no high school chemistry experience. Chemistry 100 Online covers the same content as the traditional classroom-based Chemistry 100 course but gives students the freedom to complete the coursework at times and places most convenient for them.

As part of the current academic assessment initiative at Parkland, program goals have been established for developmental courses in the Department of Natural Sciences. Program Goal 3 states that "Students . . . will become active members of society with regard to scientifically related issues." Three of the goal's supporting objectives address information literacy:

3a. Students will develop an awareness of current scientific events.
3b. Students will develop an ability to critically read newspaper and popular magazine articles on science issues.
3c. Students will develop an awareness of the relationship between scientific ideas and their societal impact.

The Scientific Information Literacy Module of Chemistry 100 Online was designed in support of these objectives. The module includes instruction in everyday information awareness, selecting a research topic, finding information in both print and electronic resources, evaluating information, and writing a research summary and a process reflection memo. For each component of the module, worksheets are assigned which students must complete and receive back before moving on to the next module component. The module is worth 20% of the course grade.

Developing Information Literacy Instruction

The process of developing information literacy instruction for an online course requires the bringing together of a number of factors which impact the feasibility and ultimate effectiveness of the instruction. Primary among these factors are three:

1. What are the instructional objectives for the course?
2. Who are the expected students?
3. What resources will be available to students?

In identifying the instructional objectives for the course, attend to both those that are departmentally or institutionally defined as well as those that are instructor-specific. In light of the instructional objectives, examine the elements of information literacy and determine which ones will be the focus of the information literacy instruction:

1. Recognize when information is needed.
2. Locate information.
3. Evaluate information.
4. Use information.

When possible, in identifying who the students are likely to be, predict student skill levels and previous academic experiences as well as demographic characteristics. Resources that are available to students include online course materials and the Internet as well as resources and services provided by other departments at the institution offering the course. At many institutions, the librarians will have already made available some online resources and services or will be pleased to do so if requested.

Having considered the three primary factors, begin developing activities and assignments that support the instructional goals of the course, that are appropriate for the students expected to enroll in the course, that are feasible in an online environment, and that make use of resources that are available to students. If possible, involve an information professional from your institution, e.g. the library instruction coordinator or the information literacy librarian, who can assist you to whatever degree you are comfortable—from brainstorming to full-scale collaborative teaching.

Finally, a number of assessment and evaluation measures should be considered. Plan how student work will be evaluated and the value of the information literacy instruction relative to other course components in determining a course grade. If the course outcomes are being considered as part of a campus academic assessment initiative, determine what measures will be implemented, e.g. Primary Trait Analysis. Finally, plan to provide students with the opportunity to submit feedback on the information literacy instruction, e.g. though the Angelo/Cross Classroom Assessment Techniques.

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The Design and Construction of Distance Education Classrooms

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Forward

Distance Education projects are multifaceted and require an array of expertise. Many of those involved in implementing educational buildings are aware of the complexities of incorporating current communications and audiovisual (A/V) technologies into the facility. However, many don't have the information they need to create spaces that are technology-ready until the building is well underway. This results in technological and operational compromises that could have been avoided with the appropriate foreknowledge of the required processes, expertise and awareness of what impact these technologies have on the building design and construction project.

This presentation will highlight some of the important issues and procedures to reduce the technological compromises in implementing new technologies in renovations, additions and new building construction. Overall, we will cover the tasks and considerations to be made roughly in chronological order, starting with considerations of the user organization through programming and team selection, and finishing with the construction and training phase of the project. As a part of this presentation, there will be a tour of The Pyle Center, a nearly completed distance education and conference center operated by UW–Extension in Madison.

Organizational Structure to Implement and Manage Distance Education Classrooms

Many organizations are already implementing some form of distance education in their facilities. These people have learned, if they didn't already know, that more is required than just an equipment purchase order. Depending on the level and volume of distance education services provided, support must be provided such as scheduling, equipment maintenance, system operations, help desk operations, and user training that were not part of the organizational structure before. These must be included in any plan to implement distance education where these services are not already provided. In addition, advance planning is equally important when more than one organization is to be implementing a shared facility.

In this case, service functions may need to be created, shared or merged and adequate time must be allowed to prepare for a smooth transition to "on-line" operations.

Assembling the Building Committee

Just as the right tool can make any job easier, having the right team can make any project easier. For more savvy users, a "Vision Committee" may be desirable to get input from faculty and other users of a facility on their vision of how technology should integrate with the new spaces. This input should be incorporated in the more traditional "Building Committee" that would normally be involved in developing the concept and requirements for a major new building or renovation. The Building Committee should include individuals from the organization's administration, instruction, production, technical and facilities groups.

Needs Assessment

A needs assessment should be conducted to determine what functions the new facility needs to provide. This should focus on *functionality*, not equipment, to determine what needs to happen in the spaces, not what equipment should be installed. Questions such as the following should be addressed: Who will be the primary users of your distance education facility? Will you need more than one distance education room? Who will they connect to? What about pure presentation rooms? What types of courses and presentations are anticipated? What kind of technical support will be required? Finally, if your organization is technologically oriented, then a complete review should be made of existing personnel and equipment. If this is an existing facility, what infrastructure is already in place?

Program Statement Development

A Program Statement is the physical result of the Needs Assessment. It forms the link between the users' requirements, design team and the actual building and systems designs. Utilizing a checklist of sequential tasks, the following typically is incorporated into a Program Statement. The Program Statement documents the entire design in 'text form.' Graphics can be used to illustrate some requirements, but room layouts and equipment lists should be avoided. There should be a description of the types of users and corresponding activities. There needs to be a comprehensive description of 1) Bricks and mortar—architectural, environmental systems, and 2) Technology—telecommunications and audiovisual systems. Once the previous tasks have been completed, a proposed budget and schedule should be developed with the help of qualified consultants or staff. The schedule should provide an overview of the project from consultant selection through user training after the new space is occupied.

Consultant Selection and Contract Negotiations

All consultants should be selected simultaneously. The traditional architect and engineering (A/E) team must be selected to begin the project design process. For a distance education facility, it is imperative to include the audiovisual and telecommunications consultants at the same time as the A/E selection due to the impact of these technologies on every aspect of the building design. Indeed, the A/E needs to understand that these are A/V driven projects. It is also important to make the distinction between A/V and telecommunications consultants that are part of a contracting organization and those that are independent consultants. This distinction is as important with these technologies as it is with the bricks and mortar architectural and engineering team. Due to the nature of this type of building, expect the total A/E fees to be higher than traditional low- or mid-tech buildings. Depending on the total project scope, consultant fees will typically range from 11%–15% of the construction cost.

Program Statement Verification

Once the design team is selected and on board, a verification of the Program Statement is required for both the user's and the design team member's understanding of the functionality going into the new facility. This may require a parallel effort to verify the bricks and mortar requirements along side the technological requirements. It will be the design team's job to take this verified information and integrate the requirements into both the building and systems designs. This is also the time to verify the budget.

Project Scheduling

Also during this early period, there should be a completely integrated design and construction schedule combining bricks and mortar work and audiovisual work. Depending on the project size expect the design and construction phases to take 1.5 to 5 years. This schedule will typically be based on the schedule developed by the Building Committee and further developed by the design team.

Design Development Strategy

Design Development is the effort to translate the Program information into the skeletal design documents that will begin to shape the building and/or renovation spaces. It is a good idea to tour model facilities at Universities and corporations to evaluate ideas for implementing the verified Program. If the distance education room(s) are to be built within an existing building, require the consultants to make an exhaustive study of existing conditions. Because these types of facilities involve a range of experts and the design needs to be well coordinated, require all consultants to attend design meetings.

Architectural Features

As design development proceeds, the various physical aspects of each room will take shape. This process involves space allocations (beware of inadequate telecommunications room and A/V support spaces), room adjacencies, room shapes, and infrastructure requirements (conduit, power, cooling, lighting, acoustics and noise control). Dedicated or multipurpose distance education rooms require a detailed integration of numerous interdependent design parameters including issues such as sightlines, lighting, participant location, desk sizing, built-in vs. portable equipment, screen sizing, equipment locations, and room finishes. All of these must be coordinated with each other and with the other traditional building trades such as mechanical, electrical and plumbing systems.

The Distance Education Room

Given the interdisciplinary design approach required, many details of the space must be examined and coordinated Some of these are:

Millwork, Casework, and Furniture

All of the built-in or portable furniture must be designed with accommodation for the technology where required. Data, power and microphone locations as well as potential video displays or interfaces may need to be integrated into some or all of the furniture, whether portable or fixed.

Teaching Wall, Presentation Wall, Screens

The "front" wall of the space will be the focus of the distance education room. Almost all of the rooms parameters are generated from this orientation. The front display screen size, presenter location, presenter video monitors, cameras, and seating arrangements are all a part of this important part of the room configuration.

Acoustics and Noise Control

The acoustical consultant needs to analyze the space for appropriate room acoustics, sound reinforcement, and interference from HVAC systems. Low reverberation and low noise levels are required for the electronics to operate properly.

Electrical Power

To provide proper grounding for audiovisual components in the system, an isolated ground power distribution system is required for these devices to prevent audio, video and communications signal contamination. The location of these outlets and capacities is coordinated between the audiovisual and electrical consultants. A similar separate isolated ground system is required for the telecommunications systems.

Lighting and Controls

Lighting systems are required that allow a presenter and other distance education participants to be properly lit for camera viewing. At the same time, the light must be controlled to prevent video displays from being washed out. Careful design and coordination is required between the Lighting Consultant and the A/V Consultant to provide appropriate fixture types, layouts and controls. Lighting may be required for multipurpose use, which may require more zoning of light fixtures and a more sophisticated lighting control system. The lighting will usually be controllable from the A/V control system, which also requires consultant coordination. Using new lighting technology, all lighting requirements should be able to be accomplished with high efficiency fixtures and electronic ballasts.

Telecommunications Infrastructure

Telecommunications must be included and coordinated in the design process. With current and future audiovisual technologies, there is more and more integration between audio, video, control, communications and computing systems. Telecommunications systems spaces must not be shortchanged in the design process to provide adequate space and support for current and future cabling and equipment. Patch panels, conduit, equipment racks, circulation, and service access must be considered.

Audio Systems

The audio systems design is intimately related to the room acoustics, noise control and furniture layout as well as the intended uses of each room. In a distance education room, the system generally needs to accommodate various audio functions and signal paths including 1) local sound reinforcement (in larger rooms), 2) instructor/presenter send audio, 3) student/participants send audio, 4) remote site receive audio and 5) presentation media audio (VCR, DVD, computer, etc.).

Video Systems

Similarly, the video system must be able to accommodate various functions. Locally, several considerations must be made:

- The displays must be of adequate size for the room size and furthest viewer. Generally speaking, the display height should be roughly equal to the distance to the furthest viewer divided by six.
- The projection system must be able to display the needed resolution of computer inputs.
- Eye contact must be maintained by coordinating with video display locations.
- Both student *and* instructor camera and monitor size and location must be considered to provide eye contact with remote sites as well as maintaining local interaction.

Signal Routing

For multiple room installations, a central routing system for audio and video may be needed to share resources such as codecs and DVD players, and to route signals between rooms or to multiple rooms simultaneously when required.

Control System

A control system is required to automate and simplify the operation of the system so that the instructor or technical staff doesn't have to push buttons on each piece of equipment to be used. Without a control system, users and staff would have to press play on the VCR, set up a codec manually and patch or route the signal paths desired by hand. The control system software and hardware provides these "behind the scenes" mechanisms to control signal routing, VCR and DVD transport control, lighting, screens and other system functions.

Control Interface

The system's control interface is a crucial and integral part of the system design. The interface determines how the instructor or presenter will operate the system, which tasks are automated or not, and how much technical staff is required to operate and maintain the system. A good and thorough interface design is imperative in the system's design phase to provide the best balance of user friendliness and flexibility.

Costs

For distance education facilities, the building costs and systems costs are higher than standard classroom budgets. For a top-of-the-line distance education room seating 30–60 people, the bricks and mortar costs may run upwards of $90 per square foot (with higher than average square feet per student), plus an additional cost of $200,000-$400,000 or more *per room* for the technology.

Specification Writing and Service Agreements

To maximize competition, require a list of three manufacturers for each piece of equipment where possible. Some equipment may need to be from a sole source to match existing equipment or due to system design requirements and equipment availability. It may also be desirable to write in to the specifications a delay in ordering certain pieces of equipment when a new model is expected to be available during the course of the A/V installation that may offer a price or performance enhancement. Video projectors are a good example of this. A well-written Part 3 (covering execution of the installation) is important to the quality of the installation, as is the enforcement of these items.

Construction Drawings

Require "section cuts" through corridors with cable trays. There should be a separate drawing for 1) electrical power, 2) telecommunications devices, 3) A/V conduit and cabling, 4) A/V casework and furniture. A detailed review of each of these designs along with cross-coordination is required to avoid conflicts and minimize compromises in the installation of the systems. If the user organization has the technically capable staff available, a review of these documents by these individuals is useful to provide additional input and "conflict-catching."

Bidding

Depending on the scope of the project and the owner's standard procedures, the bricks and mortar documents may be bid as one package or bid separately to each specialty trade. In the latter case, it is useful to release all of the bid packages simultaneously to help coordinate responses and addenda that may be required during bidding. This will also enable the contractors to start work at the same time.

On most projects, it is desirable to release the audiovisual system bids separately from the base building package. The bricks and mortar package will have the conduit and other infrastructure included in the contract. Data cabling may also be included. The remainder of the project will include the audiovisual system electronics, cabling and installation, and may include the computer, telephone and communications electronics as well.

The delay in bidding the technological systems allows for the integration of the latest technology and avoids out-of-date equipment specifications. For larger systems (generally greater than $100,000), the A/V contract is better served as separate direct contract from the other building contractors. For smaller systems, adding the audiovisual contract to the General Contractor's work can be acceptable, but direct contracts are still preferable.

When bids are received, it is important to have the audiovisual consultant review and qualify the received bids due to the expertise required to evaluate the acceptability of the responses.

Construction Administration

The monitoring of the installation of the bricks and mortar is another crucial part of the successful distance education facility implementation. Since many contractors are unfamiliar with the detailed infrastructure designs for complex audiovisual systems, it is necessary to take extra care in observing the building construction on a regular basis. The contractors must be made aware, if they aren't already, of the importance of the infrastructure details, device locations, wiring and space requirements. In addition, an overall coordinated schedule should be created to help maintain adequate coordination between building construction, electronic systems installation and user move-in. Room construction completion, power and HVAC start-up, initial room use, user training, electronic equipment installation and other milestones must be evaluated and coordinated.

System Testing

Besides the traditional electrical and mechanical systems testing and balancing, the audiovisual systems must be tested and aligned before acceptance by the owner. This process helps the owner of the system know that the installation is according the design intent. This should be a part of the A/V consultant's contract to provide technical representation for the owner organization. Audio, video and control systems are tested and aligned with the help of the contractor, and a punch list created to correct deficiencies in the final system installation.

User Training

User training of the installed system will be required to prepare users and technical staff to take over operation of the systems. This will generally be done by the A/V consultant in conjunction with the A/V contractor. In larger systems, it may be necessary to send staff to particular manufacturer "schools" for training when users will be maintaining the installed systems. This may include training for control systems, digital audio systems, editing systems, routers, teleconferencing systems or other critical equipment. This effort must be accounted for in the user's move-in and start-up scheduling.

Building Tour

As a part of this presentation, there will be a tour of the nearly completed distance education rooms in The Pyle Center, a new UW–Extension facility near completion in Madison. The facility has 11 fully outfitted Multimedia/Distance Education Rooms, 15 videoconferencing-capable Multimedia/Conference Classrooms, a 90-seat auditorium, several Faculty Development and Multimedia Labs, Video and Audio Editing Suites, a Computer Teaching Lab and an Audio Duplication Lab. The facility also features a 24-station Technical Operations Center plus 3 Event Control Rooms and a Help Desk supported by a centralized A/V Media Distribution Facility with a 35-rack capacity.

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Using ISD With Affective Instructional Objectives

Susan Leslie
Shell Services International

As business moves toward less hierarchtical organizations and more teams, individuals have more responsibility and decision making authority. Success requires a common vision. With changing corporate cultures, attitudes and core beliefs become more important. Instructional designers will be developing learning events for affective instructional objectives.

This paper discusses application of Instructional Systems Design (ISD) to affective learning objectives, including examples of well-formed affective objectives, Krathwohl's taxonomy for the affective domain, and kinds of activities.

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Today's business world has a renewed focus on values and interpersonal relationships. Emphasis on empowerment means corporations and organizations need to convince employees (and sometimes customers and suppliers) to sign-up for a set of core business values. A team approach means focusing on communication skills—not just "technical or mechanical" skills but a move away from territorial behavior and "CYA'ing" toward common goals and honest communications. This means we have to teach affective or attitude-based skills—*teach* them not manipulate people or create lip service.

While practitioners regularly use Instructional Systems Development (ISD) for cognitive objectives, we frequently have less experience applying this known technology to the affective domain. Many practitioners are familiar with Bloom's taxonomy for the cognitive domain. (Others focus only on the distinction between "lower level" objectives and problem solving . . . still fundamentally based on Bloom.) This paper extends ISD practice into the affective domain using Krathwohl's taxonomy for the Affective Domain, drawing strongly on instructional design materials written by the author for the *IBM Training Development Series*. The paper includes a chart suggesting possible instructional activities for each category in Krathwohl's taxonomy and materials on selecting instructional delivery systems.

The ISD Framework

First let's take a quick look from 10,000 feet at the ISD process for developing a learning event. Assuming requirements have been completed, the main process phases are

- High Level Design
    - Define Learning Objectives*
    - Create an Assessment Strategy
    - Define an Instructional Strategy*
    - Select a Delivery System*
- Detail Design
    - Write Assessment Items*
    - Select activities*
- Develop the Materials (including formative evaluation and revisions)

- Reproduce and distribute as appropriate
- Evaluate and Maintain

The items with a * will be discussed in this paper. (Note: Creating an Evaluation Strategy means deciding which of Kirkpatrick's four levels of evaluation you will use, how the data will be collected and how it will be analyzed.)

Types of Objectives—Cognitive, Affective and Psychomotor

Cognitive Objectives

These are objectives that deal with our thinking. Probably the most widely known way of categorizing cognitive objectives is Bloom's taxonomy which identifies six types of cognitive objectives:

- Knowledge
- Understanding
- Application
- Analysis
- Synthesis
- Evaluation

Affective Objectives

These are concerned with what we feel and believe. Krathwohl[1] (as referenced in Grunlund)[2] defines five types of affective objectives:

- Receiving
- Responding
- Valuing
- Organization
- Characterization by a value or value complex

These categories are a focus of this paper and will be further defined later.

Psychomotor Objectives

These are related to movement of the body. Simpson[3] in Grunlund[4] defines six types of psychomotor objectives:

- **Perception**—Using sense organs to obtain cues which guide motor activity
- **Set**—Readiness to take a particular type of action, including mental, physical and emotional sets
- **Guided response**—Early stages of learning which include imitation and trial and error
- **Mechanism**—Responses have become habitual and movement can be performed with some confidence and proficiency
- **Complex overt response**—Skillful performance of motor acts that involve complex movement patterns
- **Adaption**—Skill so well developed learners can modify movement patterns to fit special requirements or meet problem situations

- **Origination**—Creation of new movement patterns to fit a particular situation or specific problem

Defining Affective Learning Objectives

The form for affective objectives is no different from what we commonly use for cognitive objectives. We include the same three parts:

- Conditions
- Performance
- Criteria

Krathwohl's Taxonomy

This taxonomy helps us think about the kind of affective objectives we might want to write. He defines his five types like this:

- **Receiving**—Learner's willingness to attend to a particular phenomenon or stimulus. Concerned with getting, holding and directing learner's attention.
- **Responding**—Learner's active participation—not only attending, but also reacting in some way.
- **Valuing**—Worth or value learner attaches to a particular object, phenomenon, or behavior—ranging from acceptance to commitment.
- **Organization**—Bringing together different values, resolving conflicts between them, and beginning to build an internally consistent value system.
- **Characterization by a value or value complex**—Learners have developed a characteristic "life style" that is pervasive, consistent, and predictable. (They have internalized and automated the response.)

Applying Krathwohl's Taxonomy

Notice that Receiving and Responding are unstated objectives for nearly everything we do in training and education. We frequently create pre-instructional events whose content is motivational for just this purpose. Receiving and responding are enabling objectives for valuing, organization and internalizing values. The last category, characterization by a value or value complex (internalizing behavior), is not something we can usually expect to happen by the conclusion of a learning event. It's something we might check on at some time after the learning event. A history of such evaluations would tell us whether we needed to add reinforcing learning events to our curriculum in order to achieve this long-term affective objective.

Examples

Let's look at how an objective might differ for each of these levels.

- **Receiving**—Given a Harvard Business Review article[5] on diversity, the learner is able to demonstrate attention by *explaining the three paradigms described in the article.*

- **Responding**—Given a Harvard Business Review article on diversity and a discussion of how the three paradigms described in the article relate to the corporate vision, the learner *agrees* that implementing the emerging paradigm of connecting diversity to work is consistent with the corporate vision.

- **Valuing**—Given a Harvard Business Review article on diversity and a discussion of how each of three paradigms relate to the corporate vision, the learner demonstrates commitment to implementing the emerging paradigm of connecting diversity to work by *listing supporting activities they will do.*

- **Organization**—Given a Harvard Business Review article on diversity and a discussion of how the emerging paradigm of connecting diversity to work relates to the corporate vision, the learner *discusses conflicting personal values or preferred styles and demonstrates a desire to change their personal values or preferred styles by listing three activities that will reduce the conflict.*

- **Characterization by a value or value complex**—Given a Harvard Business Review article on diversity and a discussion of how the emerging paradigm of connecting diversity to work relates positively to the corporate vision, learners *describe events in their history that demonstrate consistency between the emerging paradigm of connecting diversity to work and their own personal values or preferred styles.*

A Second Example

Let's assume you're creating some team learning events. One characteristic of successful teams is that they have open communications. A terminal (high-level) affective objective might be: *When working with a group of three people (condition), when another individual makes a challenging statement, the learner feels comfortable responding in a non-argumentative way (behavior) as measured by a check list (condition).*

This objective is at Krathwohl's organization level because it requires the learner to look at why they might react negatively, relate this to one of their core values or beliefs, and resolve the conflict so they can react positively. (You would probably begin by developing lessons for enabling objectives at the responding and valuing levels.)

The check list might include items like

- Learner remains physically relaxed as evidenced by lack of tensed muscles, clenched hands, etc.
- Learner's voice tone is the same as their "normal" conversation.
- Learner does not use any negative "emotion-loaded" words or phrases.
- Learner addresses the issues and not the person.
- Learner clearly states
    - their belief about the challenging statement
    - how they feel (taking responsibility for their feeling and using "I" statements not "you" statements.)

These criteria are all required 100%. You might have some criteria which state less than a 100% requirement. For example, the learner exhibits at least one of the following:

- Smiles at all the other people in the group
- Maintains positive eye contact

But, you say, "These criteria are very subjective. How comfortable is the learner going to be with this?" And you're right—they are very subjective. And it *is* important whose judgment is at work here. Let's think about the situation. We're teaching teams. We want them to work together effectively, efficiently, and happily. Another way of saying that the judgement is subjective is to say that it's based on the perceptions of other people rather than the intention of the individual (in this case the learner). But that's one thing that causes problems in teams—one or more individuals with a negative perception of a team member's reactions. So who do we want to use the checklist? The other people in the group/team.

We might even rewrite our learning objective so the measurement part reads: "as measured by a check list used by the other members of the group (condition)."

Be Up-Front With Learners—Tell Them Your Objectives and Get Their Permission to Proceed

One critical thing that's different about affective objectives is that they not only need to be clearly stated to the learners but we also need to get their agreement that they are willing to work on the objectives and participate in the activities. At a minimum they need to agree that they are willing to try some new techniques to see if they want to adopt new ways of feeling and behaving. (Of course, some learners will already have the desired behavior and won't need to change—this time.)

Since we want the learner's commitment to change, our learning activities need to include strong motivational messages. In this case, perhaps a group discussion of why the company or organization has chosen to organize its work by teams and what factors make teams successful.

We need to make clear to learners that what we're asking for is not an ability to *appear* to change the way they feel by mechanically changing the way they react. Because in the long run that won't really create an authentic team. In this example, we want them to change the way they feel when confronted with uncomfortable situations. When they react differently (feel different) they will behave differently—with behaviors that contribute to strong teams.

While we are asking them to honor and respect each other, we must do no less ourselves. We must honor their choices about change.

Defining an Instructional Strategy

In my more than 20 years of experience I've seen many different definitions of instructional strategy. The one I like best is, "An instructional strategy is a methodology for how to present stimulus material to learners so it will be maximally effective in helping them master instructional objectives."[6]

In the *Course Development Process* I further defined instructional strategies by the methods used and the structure applied, and defined *activities* as the means of implementing an instructional strategy. Activities are what learners and facilitators and/or resources will be doing. Activities are the method you use.

Here are some activities you could associate with affective objectives.

Table 1. Instructional Strategies for Affective Objectives[7]

Some Method Strategies for Affective Content			
Receiving & Responding	Valuing	Organization	Characterization
Define the affective behavior. Give examples of the affect which are designed to motivate attention.	List benefits attached to a particular object, phenomenon, or behavior. List attributes commonly associated with people who have the affect. Give examples to show how the affect changes an outcome. Solve problems which identify the effects on learners and their environments of adopting the affective behavior. Use discovery activities to identify underlying affective behavior for a given situation.	Give examples of complementary and opposing values. Give examples of the range of commitment to a value. Solve problems which uncover patterns and relationships among values. Solve problems which create a system or environment which reflects underlying values Use discovery to identify underlying values in a given situation.	Use discovery to identify the learner's value system and core beliefs.. Solve problems which compare the learner's value system to relevant cultures.

Applying the Method Strategies to an Example

Using this chart for the objective on page 532, some activities we might use are: Using groups of between 3 and 5, have learners

- List five examples of personal values or styles which conflict with the emerging paradigm: Connecting diversity to work perspectives.

- List ten activities which would demonstrate commitment to adopting the emerging paradigm: Connecting diversity to work perspectives, and rate the commitments on a scale of 1–10 (10 = high).

In the larger group, using the personal values or styles from the first activity, identify any patterns or commonalities among those values or styles.

Selecting an Instructional Delivery System

So far we've all probably assumed a classroom setting for the activities we've discussed. But that's not a requirement. For some learners and some levels of change, an asynchronous delivery system might give more time to reflect, and the slower rate of change might be easier.

Here are some ways to present this material in non-classroom delivery systems. Some are more effective than others, obviously. But all are possible.

- **Videotape**—Dramatize activities showing both positive and negative examples. Provide a workbook in which the learner can record their reactions and commitments. Encourage learners to keep a journal.

- **Audio tape**—Same dramatization as for video tape, but you loose all the non-verbal cues. However, if you have teams working at a distance this might be good since it focuses them on auditory input.

- **Print self-study**—Use a workbook like the one mentioned for VideoTape and provide printed versions of exchanges between team members.

- **CBT/MM**—Use the same dramatization as for the VideoTape but add interactive questions. For example, the video could stop and ask which of several responses the learner(s) would use. This lets you do both positive and negative examples. Or you could set up a situation and ask learners to stop the video when they see a response that could be changed to support better teamwork.

For each of these, encourage learners to practice with others. You could add facilitated email discussions and other more direct interactions. While cost is certainly an overriding factor, aim at reproducing as closely as possible the environment(s) in which the desired behavior will be practiced. For example, if teams frequently meet by video conferencing, consider using video-conferencing to deliver your learning event.

Writing Assessment Items

Level 1: Reactions

Level 1 evaluations don't change from what we commonly use. We still measure customer satisfaction the same way we do for cognitive objectives. However, you might want to add some more items. For example, on a scale of 1–5, "How comfortable were you with the exercises and activities used in the learning event?" A more specific Level 1 evaluation item might be "How comfortable were you sitting on the floor for the exercises on exploring your personal values?"

Level 2: Knowledge/Skills

For affective items, level 2 evaluation is usually a self-assessment. We don't "test" the way we would for cognitive objectives. To do so would be very "big-brother-is-watching-you" like and not conducive to achieving the desired learning. It wouldn't be congruent with the affective learning objectives.

Level 2 assessment items almost write themselves when we have well-formed learning objectives. For the team skills terminal object above we might divide the participants into groups of three and give each person an argumentative statement to read. Each then has a turn to be argumentative, react and evaluate using the checklist. A follow-on activity might be a large group discussion on how people felt about the exercise.

Level 3: Application

Level 3 is the same as for cognitive objectives. For the team objective above we'd go back to teams six weeks or so after the learning event and administer a questionnaire or do a focus group on what if anything had changed.

Level 4: Business Results

Level 4 is also the same as for cognitive objectives. It is, of course, very difficult to prove any cause and effect relationships. You might want to do this one at a curriculum level. If you had a curriculum for team building you could compare some relevant business measurement before any team had started the curriculum with that same business measurement after all teams had completed the curriculum. Even this would be persuasive rather than evidentiary.

Summary

This paper applies Krathwohl's taxonomy for the affective domain to writing affective learning objectives, writing assessment items, identifying appropriate learning activities and selecting or adapting to non-classroom delivery systems. The paper uses examples to demonstrate the use of the taxonomy.

Teaching affective objectives requires an honest respect for the learner's right to choose whether or not they want to change core beliefs. The learning event motivates the change and provides tools for making the change.

Krathwohl's taxonomy can help instructional designers organize their objectives hierarchy and contribute to more efficient design of learning events which target affective objectives.

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Learn to Use the Web to Learn

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Introduction

Knowing how to employ the World Wide Web (WWW), and other learning technologies, in teaching and learning is rapidly becoming a prerequisite skill for a lecturer in higher education. The benefits of using the web to increase the "access" and decrease the costs of course delivery, in terms of time and money, have been well-documented (McArthur and Lewis 1997, Ritchie and Hoffman 1996). There is also a growing amount of research that suggests that prudent use of the WWW can enhance learning beyond more traditional approaches (Laurillard 1993, Waddick 1994, Block 1997, Owston 1997, Eklund and Eklund 1997, McCollum 1997).

McArthur and Lewis (1997) have made mention of comments made by those who have lauded the revolution in technology as the "savior" of education, particularly in respect to quality. Atkinson (1997) points out, that the revolution in technology has not automatically led to improvements in pedagogical practices and therefore the quality of teaching and learning. Duchastel (1997), and, Andrews and Bowser (1995), suggests that the design of many learning web sites are based largely on what the teacher or designer has seen on the WWW and/or their current experience with classroom-based teaching strategies. Bissell (1996) laments the common practice of simply using learning technology tools, like the WWW, as a new way of carrying out old exercises. Bissell suggests learning technology tools can play a more important role in improving pedagogical practices. In particular, that learning technologies can help students to learn better by enhancing the construction of students' own conceptualisations through contact with others' conceptualisations and the opportunity to create and develop something that is externally shareable—an object, model, text, computer program, dialogue etc.

Training

While there are many training courses that teach users how to build web sites, few explicitly address the role of the WWW in relation to teaching and learning processes (Hauck 1995, Andrews and Bowser 1995, Wagner and Breighner 1996, Driscoll 1997). Training programs that do focus specifically on training teachers tend to adopt traditional pedagogical techniques such as "copy-the-instructor" workshops (Freeman 1998).

Personnel from the multi-media and educational staff development sections of Ngee Ann Polytechnic have designed a training program entitled IT Starters. This program is aimed at helping lecturers develop skills related to constructing a module (subject) web site, using a simple web authoring tool, while at the same time exploring and developing an understanding of how to apply pedagogical principles in a manner that will facilitate quality learning outcomes.

The Ngee Ann development team adopted a constructivist approach to training. In doing so it was agreed that there is a need to constantly work towards a shared understanding of what should be the purpose of the program and what processes constitute quality or deep learning. In particular the team agreed to continually investigate what processes, particularly those offered by the WWW, can contribute to quality or deep learning.

The purpose of the IT Starters program is to help lecturers better understand more about student learning and their role as a teacher when using the web (see Table 1). These purposes continue to underpin the ongoing development and improvement of the IT Starters training program.

Table 1: Purpose of the IT Starters Program

Help lecturers . . .

. . . better understand and apply principles of student learning when using the web;

- A web site should be designed to help meet the needs of the learners and what they are required to achieve for the future work place. This is best achieved through teaching and learning processes more consistent with a constructivist, rather than instructivist, approach to teaching and learning.
- A module should be designed so that students are clear about the objectives that need to be achieved.
- Ideally the module learning (which includes the use of a web site) would have multiple approaches and pathways to desired learning outcomes.
- The web should help students become more independent and effective learners by helping to make the learning process more explicit.

. . . adapt to the role of a Facilitator when using the web to teach.

- At Ngee Ann Polytechnic the aim of a module web site is to enable students to learn in conjunction with current synchronous learning. The different methods should be distinct yet complimentary. The web site should encourage learning with minimum lecturer intervention. Each lecturer needs to determine how a module web site can be best used in conjunction with other learning methods i.e. the current tutorial and lecture system.
- The student must be able to make sense of the web site without the lecturer having to be physically present to explain all its features. The role of the lecturer in using the web to teach is to guide and facilitate student learning, from a distance both in time and space.

Constructivism: Walking the Talk

Henderson (1996) in a review of constructivist teaching practices states that teachers must think for themselves and not simply follow the directions of others. Henderson encourages teachers to conduct their own research (action research) as to how they should improve their teaching practices. Henderson further argues that the learning of students is related to the learning of teachers and that "stunted teacher growth leads to stunted student growth." In keeping with a constructivist paradigm it was decided that the training in the use of learning technologies should "model" the constructivist learning processes that underpin quality learning. Modeling learning process can be a powerful way to train:

> It is useful to remember the educator's maxim, Teachers teach as they are taught, not as they are told to teach. Thus, trainers in constructivist professional development sessions model learning activities that teachers can apply in their own classrooms. It is not enough for trainers to describe new ways of teaching and expect teachers to translate from talk to action; it is more effective to engage teachers in activities that will lead to new actions in the classroom. (SED Letter 1996)

The decision was also taken that a significant part of the training be delivered on-line via the WWW. This would allow lecturers to embark on a journey of learning that could be an allegory to their own students' learning using the web. Helping lecturers to appreciate what students experience when faced with the expectation of having to learn using the web is a critical element in the training, since empathy and reflection is fundamental tenant of constructivist learning (Henderson: 1996, and Brunning et. al.1990, Gordon 1996).

It is acknowledged within the development team that the training needs to be active. The first part of the training centers on participants learning to use a web-authoring tool (Microsoft FrontPage98). Program participants learn to use this tool to build their own web site. Given that many of the prospective program participants have very little knowledge in building a web site, and the more important objective is to learn how to build a pedagogically sound web site, the task of learning the authoring tool was therefore simplified. Participants of the program are given a ready-made Student Learning Web Template. This template is a set of web pages (created using FrontPage98) which participants can manipulate and formulate their own web site (see Figure 1).

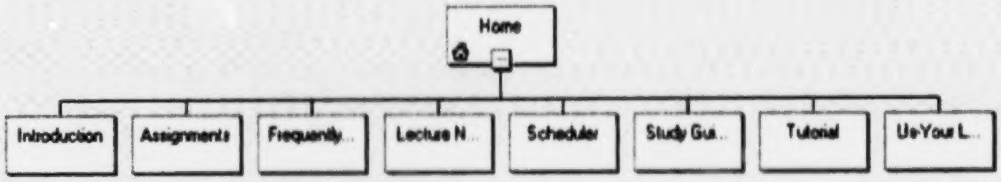

Figure 1: Navigator view of the student learning web template.

The main features of the online training are a set of modules, located on a specially designed web site. These modules are intended to teach basic competency in the use of FrontPage (IT Starters: 1998). An introductory workshop, on-line discussions, and on-line help-desk support this aspect of the training. As the lecturers work through the on-line modules and embellish the Student Learning Web Template they are alerted to certain design features built into the template that illustrate particular pedagogical principles important for learning. Participants are encouraged to evaluate and modify the template (and are taught how to do so) to suit their needs when formulating their own web site, however if they do make changes to the template they are asked to give a rationale for the changes. The focus of the communication between the participants and the training facilitators is to support the development of their technical skills and to cause them to reflect on what they are doing in terms of developing a web site that will help students to learn.

To assist in the reflection process, a face-to-face workshop is held after several weeks of participating in the on-line learning process. In this workshop lecturers share with their peers what they have been able to do with the template in developing their own module web site. The training facilitator helps the lecturers, in this workshop, to reflect on how well (or poorly) they learnt from the IT Starters web site with the intention they would use this reflection in carefully considering how to further design their own module web site. In this workshop participants are also introduced to the Web Learning Guide, which is an accompanying set of web pages aimed at giving specific pedagogical advice in the form of ideas on what could be put on each of the suggested template pages.

The pedagogical advice and the principles underpinning the design of the template is based on suggestions from a wide variety of literature. Some of this literature is reviewed and presented in an annotated bibliography (IT Starters 1998). A summary of the design features of the web template and the IT Starter web site can also be found elsewhere (IT Starters 1998).

The IT Starters web site, including the Web Learning Guide, employed in the training are constructed using the same template the program participants are working with. The hope is that as lecturers become more accustomed to learning from the web site, they will better understand how to help their students to learn using their own web site which can be built using the same template.

Results

Up to June 1998, 55 lecturers had been through the IT Starters training program. Training was conducted for individual departments, these so far have included: Accountancy; Biotechnology; Mechanical Engineering; Building; and, Film and Media Studies. The training has been staged over periods of six to eight weeks for each department. The average years of teaching experience amongst participants varied from one department to the next. In one department the average was 15 years and in another it was only two years. This meant that each department brought different expectations and levels of experience to the training. Familiarity in using the learning technologies varied from department to department, however, the majority of participants had very little or no experience in building a (educational) web site.

Feedback from the participants about the training program has been mixed. Participants have suggested that the process of learning on-line (using our web design) is challenging because it requires a new approach to learning. Many lecturers expressed a preference for the training to be delivered in the more traditional face-to-face format wherein they could "simply follow the steps of the instructor." Some of the feedback comments were:

> "This course should be taught like any other new software package i.e. hands on with notes."

> "The [face-to-face] workshops were more beneficial than going through the on-line tutorials."

This feedback raises the question of how effective are the on-line tutorials, and indeed the whole process associated with the training program. The development team is very sensitive to the difficulties of the participants in respect to their learning, and has constantly questioned how the on-line materials and workshops can be improved to help the learner. This has led to several changes including a complete reworking of the on-line tutorials. However, at the same time the team has been encouraged by the participants willingness to reflect upon these "weaknesses" and consider them in light of designing their own module web sites. One lecturer said

> "There is quite a lot of material to absorb from watching the demos. Sometimes I am not sure what is happening on the screen. At times I feel overwhelmed. Maybe this is how our students feel?"

The types of reflections shared between colleagues, especially during the second workshop as participants present their own web pages, has encouraged the training team and given them confidence that the training process is working. There is a general agreement from most participants that the course has changed their initial approach of wanting to use the web to "dump" their lecture notes. They feel the need now to carefully consider the use of a web site in respect to student learning.

> "The most beneficial aspect of the program was the thought processes that goes into putting in information on the web."

The training has raised the level of enthusiasm for the use of the web in learning. A post course survey reported 90 per cent of the participants were more positive about web based learning than they had been previously.

> "As a result of the program I have begun to find a lot of interest in this area."

Participants in giving feedback to one another about their web sites and their choice of links to other web sites via their own have shown they are developing an ability to discriminate a well designed educational web site from a poor one.

In the formal evaluation most participants expressed that their understanding of learning on the web had increased because of the training. And just as important, most program participants planned to use their web sites in their teaching.

> "I will definitely use my web site in my teaching next semester."

Conclusion

The IT Starters program has been regarded by the training development team as a success because it has helped lecturers to think more carefully about their teaching and student learning. The training development team realises that they, along with program participants, have a lot more to learn about using the web to learn in higher education. In addition they recognise the need to better understand how to train lecturers in the use of the web, using the web. As constructivists, the development team accepts that there is always the need to continually examine the learning of the lecturers, and their students, and seek out better ways of assisting them both to learn more effectively.

The IT Starters program, using a constructivist paradigm, has not attempted to be comprehensive or prescriptive about how to use learning technologies, rather the aim has been to ensure the lecturers have an opportunity to learn for themselves how useful, or otherwise, the web is for learning. Wild and Omari (1996) have stated:

> There is a tendency to see the Web as a convenient, valuable and inexpensive medium over which to conduct professional development. However, as a tool for professional development, the Web probably caters no better than traditional media. Certainly it can provide the means and resources for professionals to think about their own and others' practices, to question their own assumptions in a given domain—but it cannot presuppose that readers will actively process given information in these ways. At best, it can be hoped that readers will reflect on their own experiences or perhaps use the material presented to construct or guide their professional experiences in some way. But effective professional development, as with all learning, has to provide active means of processing and communicating experiential, empirical and theoretical knowledge—and its unclear that the Web can comprehensively provide these means.

The IT Starters program has gone some way to demonstrate that the web can be used as an effective tool in facilitating good quality staff development (learning) in a tertiary education institution. The web can be used to help lecturers to actively process and communicate experiential, empirical and theoretical knowledge—if it is designed around modeling the very pedagogical principles staff developers desire lecturers would conceptualise and apply.

Conference Workshop

The conference workshop is an attempt to explicitly model the constructivist learning process. Participants will be asked to discuss their own learning processes using the WWW and relate this to the development of their own subject web site.

In this workshop participants will be given the student learning web template and accompanying editing software. Participants will be asked to think how the web template can be incorporated into the mainstream of learning experiences currently offered at their own institution.

By the end of this workshop participants should be familiar with the template and the accompanying support materials enough to take away the template and develop their own subject web site.

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Autobiographical Sketch

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Converting Education Material to a Dynamic Learning Environment

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Abstract

In the ideal learning environment learning occurs on demand, when the need arises. The organization values the knowledge and experience of its own people. The university values the student as a fellow explorer and contributor. You have a significant investment in educational and in-service courses and you want to convert some of your programs to a flexible format that employees and students can get to anytime or anywhere. Further, you want ownership of the education program to stay with the experts so that contributions and updates can occur as needed. Our workshop teaches you how to convert traditional courses to a dynamic learning environment.

◆ ◆ ◆

As the industrial era evolves into the information age, knowledge becomes the most valuable capital asset. The organization's knowledge and expertise exists at the operating levels. To capitalize and manage this asset, training and development is changing from a uni-directional instructor-speaks-and-student-listens model to a dynamic knowledge network. University programs are relying less on lectures and structured labs and more on repository-based environments where learning is delivered when and where it is needed and content is incorporated from many sources (including the students themselves).

Where people's knowledge and experience are valued, there is a shift from a classroom model to repository-based environment. Universities that expect to serve the growing population of life-long-learners are changing their delivery to student-driven learning networks. This shift requires not only a change in form and organization of educational material but also a redefinition of traditional roles and expectations. What follows is a recipe for converting an instructor-classroom model to a dynamic environment.

Inventory Your Course Materials and Resources

Decide on a small subset of your educational offering and build an inventory of course material and resources. Many organizations have hundreds (sometimes thousands) of hours of classroom material. Most universities have a wealth of material but it is in a wide variety of unrecorded formats and locations. It is not important to transcribe every piece of content, but you do need to have an accurate inventory of the available material. The course syllabus is an obvious place to start—it may list the articles, books, videos, and support tools used during a workshop. The majority of useful course material in most organizations is in the head of the instructors. Every instructor gathers examples, explanations and illustrations that have proven useful in previous course offerings. In the traditional classroom-instructor model there is little motivation to record this content, but to the student it is often the most valuable part of the experience.

Define the Baseline

Industry	Academia
If your effort to create a dynamic learning environment is being evaluated to assess return on investment or increased efficacy, you need to gather information about the current cost structure. ❖ How is training evaluated now? ❖ How is its effectiveness being measured? What is the cost per training hour? ❖ Do supervisors regard the current training program highly? Many organizations do not gather this information, but without it you have no objective basis for demonstrating improvement.	If your effort to create a dynamic learning environment will be reviewed by your curriculum committee, you need to gather information about the current courses. ❖ Are there measures other than student evaluations? ❖ Is there an advisory board monitoring academic performance? ❖ What is the cost per credit hour? ❖ Do professors of advanced courses regard the current course highly? Many universities do not gather this information, but without it you have no objective basis for demonstrating improved efficacy.

While you are creating your material inventory, you can collect answers to these questions. This baseline information is easy to ignore, but it is a valuable asset that will be lost after changes are implemented.

Verify That Content Is Up-to-Date and Accurate

Course material is often the last repository of information to be updated when changes occur. There are usually inadequate resources applied to maintaining training material. During the conversion process, identify the events or situations that cause your material to change. For example, content change will occur with a new software version, new better textbook, new government regulations, a challenging research study, or the introduction of a new product line. By listing the source of change you can identify the items in the inventory that must be reviewed for content changes. This information is also valuable for dynamic maintenance of the material. When a new regulation is issued, you will know which portions of the course material to review.

Map Tasks (Activities) to the Content

Industry	Academia
In a dynamic environment, learners are faced with a task to perform or an activity in which to engage. At that point they know they must perform. At that point they must utilize the skills and knowledge which is the course content. Employees should be able to find learning resources to help them, either to learn the material or for on-the-job reference. To ensure the content and the task are aligned, each item in the inventory should identify the task or activity in which the skill or knowledge is used. This information might suggest meaningful ways to organize the material. For example, if a clerk must use material from several chapters when issuing a specific report, reorganizing the material so the task-related material is presented together will prove more meaningful to the clerk. A researcher may need information from several existing modules when analyzing a numeric sequence. Presenting the information needed to perform that type of analysis makes the material more usable.	In a dynamic environment, students may be required to complete an assignment or a project. At the time the assignment is given they must utilize the skills and knowledge which is the course content. Students should be able to find knowledge resources to help them complete the work successfully and demonstrate their mastery of the material. To ensure the content and the expectations are aligned, each item in the inventory should identify the assignment or project in which the skill or knowledge is used. This information might suggest more meaningful ways to organize the material. For example, if a student must use material from several chapters when writing an essay, reorganizing the material so the objective-related material is presented together will prove more meaningful. A student may need information from several articles when creating a design. Presenting the information that is used to build the design makes the material more usable.

Build Guide to Reference Material

Industry	Academia
In a dynamic environment, performance-support materials are extensions of the learning material. Instruction focuses on the typical situation or most common requirements. Special cases, variations on a technique, seldom used procedures and infrequent error messages can be organized into reference guides used when needed while learners are on the job. Which items are included in the training material and which are placed in the reference guide is a decision based upon frequency, immediacy, and criticality.	Not all aspects of a topic can or should be presented at the same time. Instruction may be based on a prerequisite structure. Special cases, obscure but interesting opinion, remedial material and tangential analysis can be organized into appendices to be available to interested students. Which items are included in the core material and which are placed in an appendix is a decision based upon project and examination expectations.

Determine the Medium

Dynamic learning does not require a high-tech environment. We have implemented paper-based and mixed systems with great success. The key is to provide the educational and reference material in a form that is accessible and convenient to the learner. If all learners have access to the organization's intranet, then a web-based format may be effective. If the organization has an effective means of distributing and updating documents, then manuals and job aids should be used. The content and medium of educational material must be in synch with the learner's environment.

Redefine Roles

Industry	Academia
The change to a dynamic learning environment requires changes to important organizational roles—trainer, area expert, and supervisor.	The change to a dynamic learning environment requires changes to important university roles—student and professor.
Trainer Trainers lose the 'sage on the stage' role. Their role is now to coordinate area experts, conduct 'train the trainer' sessions, monitor learner progress and maintain the knowledge repository. The trainer is responsible incorporating updates into the learning material. Their role also includes collecting ideas and input from employees and integrate these improvements into the repository.	*Professor as Content Expert* Researchers and subject experts adopt the role of repository managers. They are responsible for ensuring the latest, most relevant material is in the repository for use by instructors and students. They also monitor student responses and projects with an eye toward identifying potential improvements to the way material is organized and presented. In many institutions, this role is performed collectively by the department faculty.
Area Expert The area experts are people who have experience in the subject matter and work closely with new learners as peers and mentors. In the dynamic environment the area expert gets the recognition for what they have been doing all along—tutoring, correcting, and teaching.	*Student* In the dynamic environment, the classroom is no longer the primary site for dialogue. Students need access to mentors to whom they can direct questions and talk about difficult assignments. Many times students with more knowledge in the subject matter will take on this role.

Supervisor Supervisors adopt a monitoring role in the dynamic learning environment (a role they should have been performing all along) and ensure that training happens. They encourage the work of the area expert and learner by ensuring that they have time and opportunity to work on their courses and including the learner's progress on performance evaluations.	***Professor as Instructor*** Instructors lose the 'sage on the stage' role. They do become the facilitators of a student's exploration of a subject. They monitor student progress, evaluate projects and exams, and guide discussions. The instructor also plays the role of supervisor, making sure a student has the resources and direction needed to learn a subject and demonstrate his/her mastery.

Define Evaluation

Industry	Academia
Evaluate at all Kirkpatrick levels: trainee reaction, pre/post test evaluations, job performance study, bottom-line results (duration, volume, cost, productivity). Monitoring improvement starts with comparing recent data with baseline information gathered earlier.	The department's curriculum committee reviews student evaluations, monitors standardized test results, input from advisory boards and other faculty members.

Establish Mechanisms for Updating Repository With Knowledge From the Field

Industry	Academia
The employee on the front line is often the first to identify innovations. The environment must encourage the collection and distribution of useful knowledge, procedures, and ideas. Incorporating improvements and advancements as they are discovered enhances the value of your training material.	The dynamic environment brings students into the role of contributing members of the group. They are explorers of the subject matter and their input is a valuable source of new knowledge. Instructors must encourage the collection of useful examples and insightful questions from student participation. These contributions can be incorporated into the course material as part of the continuous evolution of the repository.

Call to Action

There are three forces at work driving the shift from a seminar/classroom orientation to a dynamic learning environment:

- Increased rate of technological change (creating increasing demand for new and updated skills)
- Increased demand for greater productivity (leaving little or no time for education)

- An increasingly diverse learner population (varying skill levels, different learning styles, divergent educational needs)

Organizations must capitalize on the valuable work represented in current course material by transforming existing material into a useful part of a learning network. By reordering learning material we begin to realize a dynamic environment where knowledge is available when needed and the individual can be both learner and contributor.

Autobiographical Sketches

Christine Sevilla brings a unique perspective to information design and instructional design with over fourteen years of experience in the fields of health care management, consulting, performance improvement, evaluation, business process facilitation and operations redesign. She has designed major education programs for target audiences as diverse as front-line staff, physicians and graduate students, in multiple formats, from multimedia to traditional. She has developed performance strategies that achieved significant operational improvement and cost savings. Ms. Sevilla holds a Masters degree in Public Administration and a Masters of Science in Instructional Technology from Rochester Institute of Technology, where she was recognized as one of two outstanding RIT adult scholars.

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Timothy Wells is on the faculty in Information Technology at the Rochester Institute of Technology, teaching in the Masters of Software Development and Management program. He has been active in converting this Masters program to a distance learning format. Mr. Wells has worked in the software industry for over 23 years, including positions of project manager, supervisor of systems and programming and management consultant. His current focus is on information assets management and the effective use of technology for improving organizational performance. Mr. Wells earned a BS in Mathematics and a Masters of Business Administration.

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2+2 Distance Learning Programs: Fertile Grounds for Inter-Institutional Collaboration

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Overview

Abe Lincoln is the patron saint of distance learners. This American icon of personal achievement had a serious "access problem" to higher education in his day. But he learned how to learn using the technologies and social networks available to him on the then western frontier. As president, he created the land grant system (the Morrell Act of 1863), which expanded access to, and enhanced the relevance of, higher education for generations of Americans.

Today, not new land, but new technologies, and the new social and institutional networks that support technology-based learning, have created a breakthrough moment in higher education. Lincoln would have embraced this moment. Governors State University (GSU), located in the land of Lincoln, embraced his name for a new program to expand access for adults to bachelor-level education by using both distance learning technologies and new social and institutional networks in higher education.

Three Features of Governors State

The combination of three characteristics of GSU led to a unique national initiative in distance learning.

1. GSU is an upper division and graduate university conceived in the late 1960's to link easily ("seamlessly" is the new common term) with the community colleges emerging throughout the state. Thus GSU complements rather than competes with community colleges for freshmen and sophomore students. All students at GSU "transfer in." Their average age is 34. Most work full-time and study part-time. We don't recruit students away from community colleges. By partnering with community colleges, GSU works to enable placebound adult students to use whatever local and distance-delivered academic programs available to them to proceed with their education beyond the associates degree.

2. GSU offers the Board of Governors Bachelor of Arts degree. This flexible, student-centered, non-traditional academic program allows adult students to transfer many forms of prior learning (coursework, portfolio, standard exams, ACE-evaluated training, etc.) into the program, and then design with our academic advisors a customized curriculum leading to the baccalaureate degree. We want the rigor of the program to be in the courses students take, not in the bureaucratic formalities that students must follow to get them. It is more important that the courses be right for the student than they come from GSU. Thus the BOG program requires students to take only a minimum of 15 semester hours from GSU for the BA degree. Because these courses can be taken by telecourses, all requirements for the degree can be completed without coming to the campus.

3. GSU produces and offers telecourses. Nationally, most telecourses are offered by community colleges for lower division credit. The great majority of the 175 Going the Distance (GTD) institutions who use telecourses distributed by PBS are community colleges. GSU developed a teleclass format for upper division courses that focuses on teacher-student interaction, and whose lower production costs make it feasible to supply the smaller, upper-division niches in the telecourse market. GSU faculty are used to teaching through telecourses, and the administrative systems to support distance learners are largely in place. Out-of-state students pay in-state tuition rates for GSU telecourses. This capacity enables GSU to collaborate with community colleges anywhere in the country in a 2+2 partnership for adult distance learners by supplying in a cost-effective manner the upper division courses required for the bachelors degree.

These three features (upper division, a flexible bachelors degree, and anywhere/anytime telecourse delivery) combine to create the opportunity to extend bachelors education in tandem with community colleges to placebound adult learners anywhere in the country. But opportunity is one thing, and actually doing it requires leadership, ideas and resources. In 1996 GSU received a grant from the Fund for the Improvement of Post-Secondary Education (FIPSE) of the USED to develop the operational systems and inter-institutional relationships between GSU and a set of community colleges to realize this concept across the country. ABELINC is an acronym standing for "Adult Bachelors Education: Learners and Institutions Networking and Collaborating." A list of partner institutions, and other information about the ABELINC Project is available at http://www.govst.edu/bog.

Community Colleges Setting the Pace in Distance Learning

Many faculty and administrators in universities tend to view two-year institutions as junior versions of themselves. Yet the reality is quite different. In the realm of technology, many community colleges have built distance and flexible learning programs that senior institutions have trouble imagining, much less implementing. There are at least three reasons for the technology leadership of many community colleges: the imperative to expand access is felt more keenly by community-based institutions, the scale of operation is often larger and thus more conducive to technology-based solutions, and the faculty tend to have a lesser degree of exclusive individual ownership of courses in the curriculum.

In addition, one tends to find the process of "unbundling" academic functions (ref. Dolance and Norris, 1995) further developed in community colleges than at universities. This refers to the separability of (1) production and design of a course of study, (2) delivery of the course through a teaching-learning process, and (3) assessment of student learning outcomes. In the traditional model, a teacher develops and organizes the course content, teaches it in a classroom on campus, and evaluates students' learning. No single model is best for all situations. Unbundling these three academic functions conceptually, and sometimes operationally, opens new space to innovate in the delivery of higher education.

Two-year colleges are becoming service platforms in their communities to support their local students to gain access to a growing national market of distance learning programs. Most universities, including ourselves at GSU, have a lot to learn from community colleges about the flexible delivery of higher education beyond the campus.

From Transfer to Dual Enrollment

Traditional "articulation" often involves endless analysis by faculty of this course and that, with the power relationship firmly on the side of the four-year institutions. State-wide articulation initiatives, often driven by impatient legislators, have forced a more balanced relationship in the transfer process in many states. But student-by-student decisions about credit transfer are still mainly in the hands of senior institutions. Enrollment pressures have increased recruitment of community college students by 4-year institutions earlier in the associate's degree cycle. In any case, the basic underlying concept is transfer of the student, rather than a collaborative partnership by two institutions to educate the student.

The ABELINC model moves beyond transfer to a concept of dual enrollment. Students may enter the BOG/BA program anytime after 30 semester hours, even as they continue to completion of their associates degree. Whatever courses count as credit toward the associates degree will also count toward the 120 credits required for the BOG/BA degree. A completed associates degree at the home community college is required. Based on an individualized study plan, the student may then take further courses at his/her community college, write a portfolio of prior experiential learning, take CLEP and other exams, enroll in GSU courses at a distance, and even take up to 25 upper division credits from any set of regionally accredited universities to which the student may have access.

This "passport" feature of the BOG/BA program enables students to select course offerings from local universities, as well as the growing number of online and other technology-based courses available in the emerging national marketplace for distance education. The passport open access for the BOG/BA student to take degree-relevant courses from many institutions as at-large students. To some extent, quality and relevance of education can be enhanced better by creating greater degrees of consumer choice over course-taking than by the traditional method of requiring that a certain (often high) number of courses must be taken from the home institution.

Community Colleges and Post-Associates Distance Education

The concept of dual enrollment, rather than transfer, is sometimes not easy for students or community college administrators to grasp. We have all be socialized to think that taking courses at a university and getting a degree from that university naturally go together. This degree of credit mobility is a new way for students to think. Community colleges have created transfer centers, often as an office in the student services division that handles the exit-entry issues from two- to four-year institutions. A unit specialized in transfer enables the rest of the two-year college do the many other things they have to do without reference to inter-institutional relationships.

Dual enrollment partnerships involve more units of the community college. Data systems, for example, already choked with internal complexity, need to be more aligned with other institutions. Staffs at the two partner institutions, often a geographic remove, must interact and new roles relationships must be defined.

Beyond these operational challenges, distance learning programs and dual enrollment partnerships raise new issues about the mission of the two-year college in a world of lifelong learning. What is the appropriate role for the community college in brokering and facilitating post-associates degree education for its placebound and workforce-based students and alumni?

This is not the traditional question of: "Shall we become a four-year institution?" The new question is what role two-year colleges will play as "distance learning platforms" to serve their communities, both as individuals and as organizational workforce clients, as the national market for distance learning programs expands? What are these service functions and what skills and resources are needed to fulfill them? As these questions are answered, a new national infrastructure for distance education will be created.

The Irony of Geography in Distance Education

This question of community college mission raises the irony of geography in distance learning. We all know that institutions must adapt more to their students' lives, not simply insist that students adapt their lives to institutional convenience. (This adapting does not refer to academic quality issues, but to effectiveness and convenience of delivery of instruction. Alas, we sometimes get these confused.) The great value of distance learning, by definition, is its ability to go beyond geography, ultimately to make place irrelevant to the accessibility of education. Access to personal communications technology is the new variable, not place.

But just as "high tech" often ironically stimulated demand for "high touch" (ref. Ron Naisbett), so as distance learning programs expand, the community college will become more important as a convenient and responsive place for students to access learning support services. Everyone is near one. Community colleges, as indicated in their names, reflect and help to identify a local geographic community. Even as suppliers of courseware, program advising, and degree audits become more remote, local providers of support services for higher education in the information age become more integral to their communities.

Graduates of two-year colleges know their alma mater, perhaps not with the mid-life romance for sporting teams, mate-selection, and adolescent dorm life. Community college alumni tend to appreciate their institution in pragmatic terms as conduits of opportunity and affordable places to learn skills to function in the high tech economy. These roles and services will be needed at several points in a lifespan. Naturally not all the resources for bachelors level education, such as library collections, reside physically at the community college. However, the new worlds of information accessible through online technology and intra-state library loan make this less of an issue than in the past. College partners agree to allow BOG/BA student access to campus-based services, such as libraries, media centers, computer labs, test centers, through to the completion of the bachelors degree. Community colleges with mature distance learning programs adapt relatively easily to these expanded roles for their alumni who join the BOG/BA program. Their students and alumni, skilled as independent learners, collectively constitute a new and growing national market for post-associates degree education by distance learning.

The ABELINC project does not approach distance learning as a relationship between a university (GSU in the south suburbs of Chicago) and isolated "un-geographic" students located in cyberspace and also incidentally somewhere in the country. Some online programs may aspire to transcending geography totally. But for now, we believe that very few students, and very few institutions, including our own, have the trained personnel and technology infrastructure to conduct a full-fledged bachelors education online. And having an impressive list of courses "on the Internet," as they say, will not in itself do it.

ABELINC values the geographic link between the adult student and the community college campus. Indeed, we want to strengthen this relationship to a place of learning that complements and supports what students can do from computers at home and work. In most cases, it is more important, and probably more creative, that community colleges in the information age strengthen and diversify their distance learning services than aspire to four-year institutions in the traditional model.

Technologies of Instruction and Services

ABELINC does not depend on any specific technology. Live interactive TV is not appropriate because of the individualized nature of the BOG degree (there are no cohorts as such), the geographic dispersion of the student population, the absence of cross-state technical standards, cost, and our desire not to burden the community college with set-up and scheduling issues.

GSU mainly uses telecourses because the TV, VCR, telephone and fax technologies are now assessable to a very broad user population in the U.S. Telecourses, correspondence, CD-ROM and Internet courses all provide anytime/anyplace formats. GSU has recently joined the PACE consortium, led by the Middlesex Research Center, to offer the BOG/BA degree in 2+2 format to navy personnel, and to deliver upper division telecourses on CD-ROM for ships and submarines at sea.

The academic advising staff at BOG has adapted readily to advising adult students at a distance. The essential processes and issues are quite similar. One does not sense a de-personalization. Some new tools are necessary, such as a video-based self-study program on how to write a portfolio to request academic credit for experiential learning. CD-ROM advising tools are planned. Greater challenges come from not knowing the academic program options in the student's local environment, and in helping the distant student to formulate a focus of study, with benchmarks and assessment points in a concrete plan for completion.

Prior to ABELINC, the users of GSU's telecourses lived mainly in the region, and had the option to come on campus to resolve sticking points. Indeed, many students taking telecourse nationwide tend to live within reach of the provider institution, and use these flexible courses as an alternative to commuting, and in combination with on-campus options. This appears to be so for users of online courses as well.

The goal for GSU staff is to provide the same quality of support services to distant students in the ABELINC as local students receive by coming on campus. ABELINC coordinators at the community colleges have been instrumental in achieving inter-institutional partnership agreements, interpreting the program to their faculty and staff colleagues, helping to identify appropriate students for the program, and providing back-up if communication breaks down between an ABELINC student and a GSU office.

ABELINC Partnerships and Flexible Bachelors Education for the Workplace

Community colleges also tend to lead universities in adapting the delivery of instruction to workplace settings. This may be due to a more vocationally oriented curricula and to the need to be responsive to community-based employers. Employers who invest in educating their workforce increasingly want to assure that academic programs meet their training needs. Yet their needs are not narrowly skill-based while eschewing the liberal arts.

Teamwork, communication, problem-solving, cross-cultural and gender sensitivity, issues of value and ethics, critical analysis of information, ability to imagine, articulate and build support for alternatives to current practices and products are all highly valued skills in the information age workplace. They are also the hallmarks of a good liberal arts undergraduate education.

But the teaching strategies in the liberal arts for 18–22 year olds may not well suited to mid career adults fully engaged in a work setting. Corporate clients who pay for bachelors education for their workers want flexible delivery, and they want relevance and impact on behavior in the workplace. Sensing universities to be unresponsive, some have set up their own universities, without degrees and accreditation, to service their needs for higher order skills development. Community colleges have done better by workforce clients, but they do not offer upper division curriculum. ABELINC partnerships enable community colleges to add a new dimension of service to their corporate clients.

The flexibility of the BOG/BA program allows for a four-way dialogue involving GSU and the college on one hand and the employer and the employee/student on the other. If the employer is paying and the student agrees, we are pleased to construct a study plan that meets three criteria: areas of student interest, employer training goals, and academic requirements and standards for the degree. This dialogue produces a mutually negotiated study plan with a explicit focus of study and a map to completion.

Many employers appreciate that credits and degrees are academe's quality control measures. And they want quality. Completing a bachelors degree by part-time study usually takes some years. As employers worry about retaining their best workers, they appreciate the retention value for employees when they invest in long-term learning programs leading to degrees.

Degrees and other credentials were not very important in Lincoln's time. But sensing the new skill demands of the industrial age, he created the land grant university to expand access to higher education. As we move headlong into the information age, we need to further expand access to advanced learning, and the credentials that measure attainment of that learning. The old geographic boundaries and jurisdictional claims of industrial higher education are being blurred. We are glad that ABELINC is contributing to the further blurring of boundaries in search of new arrangements that will enable more adults to gain access to bachelor-level education.

Autobiographical Sketch

Glenn Shive is director of the Board of Governors Program at Governors State University, in Illinois, where he also administers the Office of Assessment. In addition, he is project director of ABELINC, a U.S. Department of Education Fund for the Improvement of Postsecondary Education (FIPSE) three-year comprehensive grant project.

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Using Instructional Design for Interactive Television Development

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Abstract

Current technology provides many new ideas and alternatives to traditional education practices. Based on current research and five years of practical experience in the application of distance learning technologies, the use of instructional design in distance learning delivery systems can be critical in the development of successful programs. This paper will look at the use of an instructional design model in the development of interactive television courses/lessons.

Introduction

In December 1993, after 6-months of intensive planning and curriculum design, The Academic Instructor School (AIS), "The Teacher's College of the Air Force," added a week of interactive television instructor training to its ongoing Air Force Institute of Technology (AFIT) instructor preparation program. This was done at the request of AFIT instructors who were beginning to conduct distance learning classes via interactive television (ITV). These instructors had recognized the need for specialized preparation to work in this new educational medium and turned to AIS for help. For the next 6-months there was continual extensive internal and external evaluation to improve the quality of this new addition to the AFIT Instructor Course.

In September 1994 a second USAF organization was directed to present a course via ITV using the blossoming Air Technology Network, the new USAF Interactive Television Network. Dr Ron Christopher (an Instructional Design Specialist assigned to AFIT), Mr Tom Wolfe (the AIS/AFIT Course Director responsible for ITV implementation to the AFIT Course), and Mr Warren Jones (Director, Air University Television Center) were tasked to provide four days of instructor preparation for those presenting this one-week ITV course.

It became very clear that the instructors' lack of understanding of this new medium in relation to course design and instructor delivery would reduce the effectiveness of the ITV course. Although the ITV Course was relatively successful, it was obvious that new guidelines for those delivering ITV courses needed to be developed to ensure a high quality educational program.

In November 1994, Air University (AU) at Maxwell AFB, Alabama, chartered a Distance Learning Process Design Team to develop a "Guidebook for Teleseminar Course Design." Over the next 6 months the team worked together to research, develop, and produce a guide for preparing new educational courses or converting current educational courses to an interactive television (or teleseminar) format using instructional design as a base. The process that was developed tracks the USAF Instructional Systems Development model very closely with modifications to address the differences imposed by working in a teleseminar environment versus a traditional teaching environment.

This paper highlights the results of the AU Distance Learning Process Design Team's efforts in order to share with others an approach to distance learning preparation and to enable them to avoid "re-inventing the wheel" while providing a successful starting point in ITV course development.

Air Force Instructional System Development

The Air Force (ISD) process is an adaptation of the systems engineering process applied to problems of developing, implementing, and evaluating instruction. As originally adopted by the Air Force, the goal of instructional system development was to increase effectiveness and efficiency of education and training by fitting instruction to jobs, eliminating irrelevant knowledge from courses while ensuring that students acquired the necessary skills, knowledge, and attitudes to do the job. Instruction was to be provided in the areas most critical to job performance and was not to be wasted in areas having a low probability of meeting immediate or critical long-term needs. This is accomplished through the use of a five-phase process including continuous evaluation at every area to ensure continuous improvement.

- **Evaluation:** An ongoing continuous internal and external process which is designed to ensure continuous improvement. From initial evaluation of the data gathered in the front-end analysis through operational evaluation and then final course evaluations, data is used to constantly monitor and then refine each phase of the educational program.

- **Analysis:** The analysis phase begins when the requirement for instruction has been established. This phase covers a wide range of analyses which may include content analysis, mission analysis, learning analysis, resource analysis, target audience analysis, etc. The results of the analyses are checked against the preliminary evaluation plan and the ISD plan is updated as needed.

- **Design:** From the data collected and evaluated, both cognitive and affective lesson objectives are written. These become the basis for determining the type of evaluation (written/performance or both) to be conducted and preparing the evaluation instruments. This phase also is used to design the instructional plan.

- **Development:** With the preliminary course outline and evaluation instruments completed, it is time to look to putting the meat of the course together. This includes determining the most effective teaching method, detailed lesson plans, support material, and appropriate supporting visual-aids. The final task in the development phase is appropriate course validation.

- **Implementation:** At this point in the process, it is time for the system to become operational. The system functions are in place, adequate resources are available, and the training system itself is ready. A critical part of the implementation is the continuous internal and external evaluations to provide for continuous improvement.

Teleseminar Instructional Design Process

In designing this process, the design team assumed that the person designing the teleseminar course is experienced as a traditional classroom instructor and is qualified to teach the content required. The ISD process then is used from not only from a curriculum designer perspective but also from a personal teaching perspective. This assumption does not negate the effectiveness of either the ISD model or the Teleseminar Design Process but does give it a slightly different perspective.

Phase 1: Selecting the "Right" Course for Teleseminar (ITV) Delivery

All too often as new technology has been developed, for many, there has been a strong tendency to use technology for the sake of using technology. Air University (AU) recognized the role of technology in education and the need for a mechanism to identify those courses which were viable candidates for distance learning and could use distance learning technologies most effectively and efficiently. In 1992 AU produced the *AU Distance Learning Curriculum Analysis and Media Selection Guide* which provided a model for course analysis and cost in determining the best use of technology and method of delivery. Although there are numerous benefits when using ITV for course delivery, not all courses are candidates for this delivery method. Even within the context of ITV or Teleseminar course delivery, a course delivered via "one-way video and two-way audio" may have different design needs than courses taught via "two-way video and two-way audio" or those taught through a Video Teleconferencing system (VTC). Early determination of selecting the "right" course obviously is a critical part of insuring overall course effectiveness and success. The media selection and cost analysis process should be completed at least 6 months prior to delivering a "candidate" teleseminar course. This then becomes the first part of the teleseminar design process.

Phase 2: Planning for Teleseminar Success (ISD Process)

The second phase of the design process is broken down into four areas:

1. **Instructor preparation:** Effectively teaching, using teleseminar as the medium (and enjoying it), requires specialized skills, abilities, and training. While some instructors have instinctively developed the requisite skills and abilities, the majority require specialized training or trial and error to become comfortable and effective with this mode of instructional delivery. Adequate training prior to the distance teaching experience and adequate support throughout the delivery process are the most effective and efficient methods for ensuring long-term success in using teleseminar as an instructional strategy and delivery mode. The majority of instructor preparation time and resources should be focused on interested, enthusiastic, and committed faculty. Some faculty won't be interested in teaching via teleseminar. Rather than spend time and resources attempting to convince the intractable, focus on those who want to learn and develop effective teleseminar delivery skills. In addition, supporting the early adopters often leads to the interest and eventual participation of the more skeptical.

2. **Audience analysis:** Planning a curriculum requires more than just a selection of a list of courses; it requires understanding the learner (customer) and their needs and desires, and the intended relationship to them among other courses chosen for

development and delivery. For the curriculum to be effective, a detailed understanding of the target audience is required. This includes ages, cultural backgrounds, interests, and educational levels of the students as well as some knowledge of the locations of the various sites to which the instruction is being delivered. Also of consideration is the experience of the students in using distance learning delivery systems and the impact of teaching with one-way video and two-way audio as is the case with the USAF prime teleseminar delivery system.

3. **Review objectives, samples of behavior, and evaluation instruments:** Based on an understanding of student characteristics and needs, which were obtained from the previous step in the process, individual course objectives are developed that build together to meet the course goals. To use a building analogy, instructional goals are the walls of the course and the objectives are the individual bricks that join together to form the walls. Well developed objectives ensure that the topic is systematically examined and the major issues are covered in a logical and sequential order. At the very least, the objectives should be stated in precise terms describing what should be done, worded clearly so that learning experiences can be developed to meet each objective, and developed in a hierarchical learning order (example: knowledge to comprehension to application).

   Objectives are measured through the means of a *Sample of Behavior*. This is written as a description of student performance toward a specific objective and is stated in measurable and observable terms. Educators have vigorously debated the pros and cons of using measurable performance objectives (samples of behavior). Opponents suggest that performance objectives unduly channel all learners down a single, inflexible instructional path. Proponents maintain that precise performance objectives make both instructors and students more *accountable*.

   The next issue to address in this step is *evaluation instruments*. At its most basic level, the purpose of educational evaluation is to provide information to decision-makers. This requires evaluative information that is objective, accurate, and most of all useful. Both formative "process evaluation" and summative "course completion evaluation" can be very useful. Formative evaluation allows improvement of the course as it is being developed or adapted. It is a good check to ensure that small instructional problems don't become obstacles or barriers that cannot be crossed. Summative evaluation addresses whether or not the students actually learned as a result of the teleseminar course. Summative feedback should focus on course relevancy and learner attitudes towards the delivery approach and the instructors teaching style.

4. **Scope and sequencing:** This part of the overall planning process requires time to look at scheduling issues and concerns related to the various downlink sites involved, the availability of students to access the downlink sites, and the points of contact at each downlink location to aid in the course preparation and delivery. It is also a time to look at the course objectives for a logical sequencing flow. This point allows for the final check of the completion of the previous steps prior to the development of lesson plans.

Phase 3: Developing the Teleseminar Course

The first part of this phase concerns developing the teleseminar lesson plan. Whenever attempting to present a formal speech or lecture, it is helpful to have preplanned the information to be covered and write this information down as a guide to follow. This guide might be in the form of note cards, an outline, a lesson plan, or a script. For conducting teleseminar instruction, a lesson plan/script can work wonders. If properly structured, it will sequence the primary lesson topics. A lesson plan/script will guide more than just an instructor. In a full television studio, it will also aid as a guide for the entire crew so that they will know precisely when to adjust camera shots and additional visual effects. Some lesson plan/scripts are formatted for use with a teleprompter which is another tool available to the instructor.

Along with the development of the lesson plan is the need for varying degrees of storyboarding. Storyboards are used to convey visual ideas and concepts. It is a way to help you think about the development of both the visuals and the text in relation to each other. The end result of this process is a series of sketches for the final drawing or photographs, along with verbal descriptions which serve as guidelines for future script writing. Using cards and sheets that can be organized into different sequences allows the opportunity to see and arrange transitions and relationships between ideas to add continuity to the presentation.

Phase 4: Preparing for the Studio Environment (Preproduction)

Classroom instructors are comfortable in the world of education. In most cases, they understand its jargon and its administrative structure. They are especially at home in the "school house" and are effective in the traditional classroom. What may not be so familiar is the world of "teleseminar distance learning" particularly the video studio or teleseminar classroom from which new educational programming originates. One has to learn how to operate and feel comfortable in this new environment. Usually the instructor's first visit to a studio or teleseminar broadcast classroom will be a step into a completely foreign environment. It is essential for the instructor to visit the broadcast facility early, whether a classroom or broadcast studio, to become familiar with the new surroundings. It is also equally important for the instructor to become familiar with the teleseminar equipment, production crew, and control room facilities. Preproduction conferences are very important to coordinate with all of those involved in the broadcast production. This is especially true if the lesson is taught from a television studio setting. It may also be the time to discuss with the television production crew tips for television platform skills.

Phase 5: Production of the Successful Teleseminar Course

Obviously there are a number of different issues concerned with preparing and delivering a teleseminar course. Having a sound design process does not guarantee success every time but it does increase the chances for an effective and successful ITV course. Everyone involved in the teleseminar process (instructors, facilitators, students, and production crew members) should participate in a conference to determine how to handle potential technical problems. Students need to accept that sometimes technical problems will arise. If a problem should arise during a broadcast, the studio staff should resolve the problem as quickly as possible if it is within their ability. The instructor, once notified of the problem should relay the information to the students. Unless the technical problems become too distracting or incapable of being resolved quickly, the instructor is obligated to continue teaching.

Summary

We have briefly looked at the outline of a successful approach to using instructional design in developing interactive television courses. Certainly this is not the only way to plan and develop ITV courses but by combining the USAF Instructional Systems Development model with a Teleseminar Instructional Design Process the USAF has provided a functional model for ITV development. Currently, the USAF Air Technology Network broadcasts ITV courses from four up-link sites across the US to 80+ down-link sites throughout the US including ten down-link-sites in Europe. As ITV continues to grow in its use as a mode of distance learning delivery, it is helpful to have an established starting point in developing courses. It is the intent of this paper to provide a model from which to build on as we in education continue to look for ways to improve our educational delivery methods.

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Education Process Design Team led to the development of *A Guidebook for Teleseminar Course Design*. This guidebook set the foundation for the Teleseminar Instructor Course, which he co-designed with Mr. Tom Wolfe. This five day course was the first course to be listed in the US Air Force Catalog of Formal Schools which addressed Interactive Television (ITV) instructor training issues and serves as a benchmark for Air University and Air Force organizations examining the use of ITV as a distance learning vehicle.

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❖ Addendum ❖

Online Testing Methods for Web Courses

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Abstract

Testing and Assessment are important components in the instructional process. Web based courses that have interactivity components built-in help students monitor progress, take learning more seriously and provide indication of how well students are learning. Online testing can also be used to collect data on groups of students and interpret this data for research studies.

Three different methods: Java, JavaScript and CGI that are available to implement online assessment in web based courses will be the focus of this presentation. Also, testing methods used in Web course development and management tools that offer integrated development environment will be discussed. The goal of this presentation is not to teach scripting or programming language but to give instructors insight into evaluating testing programs and methods for instruction and also provide information on work that needs to be done behind the scenes to incorporate online testing. An extensive online resource list that has case studies, demos, and working models will be made available to participants.

Introduction

Web based courses are becoming increasingly popular with faculty members who use online material to provide supplementary information to students. Although the first generation of courses were static in nature used primarily for displaying syllabus, schedules, lecture notes, and other course information, newer courses now use extensive interactive components such as discussion groups, listservs, evaluation and assessment as integral part of the course. Use of interactivity in courses has become popular due to availability of programs that make creating online material much easier without having to know intricacies of programming languages and scripts. Course development and management tools are being adopted by universities to help provide faculty with a user-friendly environment to integrate course materials and have these available to students over the Web.

One of the most useful components in any course is assessment and evaluation. Not only is assessment needed to provide evidence for evaluating student learning and assigning final course grades, use of assessment techniques may also better help instructors evaluate knowledge acquisition and retention rate. Well-established theories of learning emphasize the need for evaluating students understanding of concepts and providing feedback during assessment. This can be achieved by incorporating various technologies depending on individual applications and needs. Three of the most common technologies used for implementing online testing in Web Based Courses are Javascript, Java, and Common Gateway Interface (CGI),

JavaScript

JavaScript is an interpreted scripting language embedded with HTML code to develop interactive pages. It is supported by popular browsers such as Netscape 2.0 and higher or

Microsoft Internet Explorer 3.0 and higher. Once the HTML/JavaScript code is downloaded from the server, all processing is done on the client side. This saves bandwidth since all work is done locally. A typical testing example where this could be useful is when many students are required to access the page and be assessed individually at the same time. Multiple choice, fill-in-the-blank, true/false type questions can be developed by using JavaScript functions. Another advantage of JavaScript is that form validation can be built in which allows immediate feedback to be given to students based on their response. However, one main disadvantage of using JavaScript is that the code cannot be hidden completely. A user could view source from one of the browser menus and find answers in the source code. This can be overcome by using advanced coding techniques such as "cookies" that hide answers from users.

Learning a new programming language is difficult even for experienced programmers. Fortunately, there are many pre-designed JavaScript templates that are made freely available for instructors to use and customize. A list of these programs is available from the author's web site (http://sunil.umd.edu). For more sophisticated use of assessment techniques that rival those built into high-end web authoring programs, a technique called CGI is used.

Common Gateway Interface (CGI)

CGI is a server-based method that can be used to implement online testing. A student would connect to the "Quiz page" and fill out a HTML form that asks for student name and identification number. A series of questions (multiple choice, true or false, fill in the blanks) are presented to the student by the browser, and using mouse clicks or keystrokes the student enters answers to questions displayed on the screen. When all questions have been answered the test is submitted for "grading." Results of the quiz are then displayed on student screen, mailed to the instructor and/or stored in a file on the server for instructor records.

In most cases CGI scripts are written using the Perl scripting language. Perl is a common programming language, fairly easy to learn, modify, and is portable across operating systems. If setup correctly, almost all Web servers available in the market today understand CGI interface. For instructors interested in implementing testing using CGI, a freeware Multiple Choice Grader is available that can be downloaded and installed without having to write any code (see http://www.extropia.com). Only the questions and answers need to be changed by using a text editor. Installation requires access to a cgi-bin directory that is setup by a system administrator specifically to run CGI code.

Although CGI is very powerful and robust means of implementing online evaluation, there are some disadvantages to using CGI. Many system administrators do not permit use of CGI scripts on their web servers because it means allowing users with Web browsers to submit queries to a program that actually executes on the server. If not setup correctly this has the potential of allowing malicious code to be run in server space. It is imperative that security on files be checked and re-checked before allowing CGI access. Since all processing takes place on the server side, high volume of queries (example, an entire class of students taking the test at one time) puts an extra load on the server that may slow other processes running on the Web server.

Java

Java is a more complex programming language and application runtime environment similar to C++ and Pascal. Small Java programs (called applets) are created to reside on the server and downloaded to be run within browsers that uses a Java Virtual Machine which in most cases is integrated in the browser itself. Java applets are cross platform and available for use on almost all common operating systems such as Unix, OS/2, Macintosh, and Windows 3.x/NT.

For assessment purposes there are Java applets written that provide template based surveys, tests, and tutorials along with advantages of immediate grading, feedback, and downloading resulting data into any spreadsheet format. This is all done in a secure environment and implemented under common Internet browsers that support use of Java technology.

Advantages

Online testing and evaluation methods offer many advantages over paper based assessment. One main advantage is the use of multimedia within tests. Graphics, animation, video, audio files can be embedded within quiz questions for the student to observe and respond to based on scenarios. For certain areas such as language learning and music education, use of multimedia in testing offers more relevant and precise testing that was previously not possible by using paper based medium only. In general, although evidence of learning is needed to assign final course grades which would be categorized as summative evaluation, online testing is best suited for formative evaluation to provide constant monitoring and feedback as the course progresses so intervention can take place as needed.

Limitations

Some issues facing problems with online assessment are authentication of students when tests are administered. Because students take tests remotely, there is no way to determine if the tests are being taken by students registered for the course without assistance from either other students or resource materials such as text books. Online testing is also limited to objective type questions which may be best suited for undergraduate courses but may not find appropriate use in graduate courses that stress case study, discussion, critical thinking and reasoning. Also, electronically graded exams while providing feedback to students leave out the personal nature of positive reinforcement provided by using comments from instructors while using traditional paper based medium to inform students why the answer was marked incorrect instead of providing a generic response and the correct answer.

For instructors who decide that online testing is suitable for use in their classes, there are many different approaches to implement this as described above. Although high end products have more features but involve complex technical setup and high cost, use of low-end freeware and shareware programs that can be used to implement assessment in courses should not be overlooked.

Autobiographical Sketch

Dr. Sunil Hazari is Faculty Research Associate in the Robert H. Smith School of Business at University of Maryland, College Park. He was formerly Director of Technology Training & Associate Professor at George Mason University Graduate School of Education. He conducts faculty information technology workshops and is responsible promoting the use of information technology in undergraduate and graduate courses. An extensive resource list on Web Based Assessment, Internet and Teaching, and Web Based Instruction is available from Dr. Hazari's web site.

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